



T³CAS
ACCEPTANCE TEST PROCEDURE (ATP)

CAGE Code 1WYD3	Initial Release Date 04-MAR-2009	Revision Date 15-MAR-2011	Document Number 8007548-001	Revision V
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Record of Revisions

Rev	Date	Authorization	Description Of Change
-	04-MAR-0209	ECR010466	Initial Release
A	09-MAR-0209	ECR011651	Update Appendix A
B	10-MAR-2009	ECR011656	Update Appendix A, Hardware Information CRC value to 82 9A E3 AA.
C	07-JULY-2009	ECR011752	Update Appendix A with latest boot, DL, Firmware, HTS, and processor companion dash number.
D	20-JULY-2009	ECR011954	Update Appendix A with latest IOC FPGA and HTS RL and CRC numbers.
E	10-SEP-2009	ECR012033	Update Appendix A with latest FPGA, Boot, Data Loader and HTS RL and CRC numbers. In addition, add a 2 nd table to Appendix A to describe operational software loading after ATP testing.
F	23-SEP-2009	ECR012062	Update Appendix A, Table A-2 to account for Operational Software/Firmware changes for LRU TQE00211.
G	25-SEP-2009	ECR012067	Update Appendix A, Table A-1 to HTS RL Version 9.
H	04-MAR-2010	ECR012192	Update to add Black Label SW/Firmware and Testing procedures to support Production Build of Black Label T ³ CAS LRUs.
J	19-MAY-2010	ECR012440 ECR012494	Update to add T ³ CAS SW/Firmware to support Label 377 and FPGA mods. Added Burn-in and ESS procedures, updated Appendix B cross-reference, removed DPSK systems test in Appendix C and added steps to calibrate LRU on EIT Station.
K	4-JUN-2010	ECR012543	Moved Bonding test to end of process flow. Updated Appendix C with clearer information for running tests and modified to ensure greater coverage of testing over temperature. Updated manufacturing flow process. Updated step 6, 7 and 8 of Appendix D to reference step 5 instead of 7.
L	21-JUL-2010	ECR012618	Update the flow process to define receiver filter tuning. Cleaned up and added additional detail to the system performance testing section. Added details for regression testing.
M	27-JUL-2010	ECR012625	Add the TAWS and Obstacle databases to Appendix A, add step to install databases to Section 5. FTRs in Appendix F changed to include header information and be on separate sheets.
N	11-Aug-10	ECR012635	Change Section 5 Manuf. Flow Process to specify 12 hour ESS, Add Burn-In after final Systems Test. Section 5 also includes flow process after minor/major repair. Corrected example temperature compensation values in F.4. Added Appendix G, Subset of System Tests.

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Rev	Date	Authorization	Description Of Change
P	21-Sep-10	ECR012711	Added section A.3. Update section A.2.1 with HTS to 9500002-003. Added section A.3 for Ethernet loading. Updated section 3.f of appendix D. Update 5.9 to include power on during cold soak.
R	12-OCT-10	ECR012755	Updating section 5.1.9 to include power off during soak. Removed DO260A_2_3_2_4_2_PART1.scp as a required test during Hot/Cold and regression testing. Updated RCAL command to RCAL 0 2000 1 in all locations.
T	11-JAN-11	ECR012889	Added C.7 Taws verification Testing and shifted other tests down.
U	11 FEB 11	ECR012883	Added New T3CAS TAWS Database -002
V	15 MAR 11	ECR013041	Add T3CAS Terrain Database -003 Added New T3CAS Obstacle Database -13. Added EIT station as normal manufacturing process. Updated panel config and power up in Appendix C. Added note to section 6.4 to reference Reverse Power Sensor Test changes.

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1 INTRODUCTION

This document is the Acceptance Test Procedure for the T³CAS Computer Unit.

1.1 Purpose

- To provide the manufacturing flow process for T³CAS end item
- To provide alignment instructions for T³CAS CCAs
- To provide instructions on the loading of test software for T³CAS end item testing
- To provide instructions on the calibration of the T³CAS end item
- To provide instructions on the execution of a T³CAS Pre-test/Final Acceptance Test utilizing automated test equipment with embedded Hardware Test Software (HTS)
- To provide instructions on the execution of the Electrical Bonding Interface testing
- To provide instructions on the execution of the Environmental Stress Screening (ESS)
- To provide instructions on the loading of Operational Flight Software
- To provide instructions to perform Operational Flight Software End Item testing with the T³CAS System Test equipment

1.2 Scope

This Acceptance Test Procedure (ATP) specification establishes the manufacturing and operational requirements that the T³CAS Line Replaceable Unit (LRU), part number 9005000-10000, must meet to ensure that the unit is in proper operating condition.

1.3 Referenced Documents

Table 1-1: Referenced ACSS Documents

Document No.	Description
8007547-001	T ³ CAS Test Requirements Document (TRD)
8007555-001	T ³ CAS Transmitter CCA Calibration and Test Procedure Document
8007573-001	T ³ CAS ESS Burn-in Procedure
8007770	T ³ CAS Receiver CCA Filter Tuning Procedure Document
9001041-001	T ³ CAS System Test Station
9001056-001	T ³ CAS Peak Power Meter Software
9005000-10000	T ³ CAS End Item Assembly – 6-MCU (AC/DC)
9005039-001	T ³ CAS End Item Test Station
9005108-001	T ³ CAS End Item Test Station Software
T360096	TCAS Transmitter Test Fixture

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Table 1-2: Referenced Industry Documents

Source	Document No.	Revision	Description
RTCA	DO-181C	June 12, 2001	Minimum Operational Performance Standards for Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/MODE S) Airborne Equipment
RTCA	DO-185B	June 19, 2008	Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance System II (TCAS II)
RTCA	DO-260A	April 10, 2003 Change 1: June 27, 2006 Change 2: December 13, 2006	Minimum Operational Performance Standards for 1090MHz Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)

1.4 Acronyms and Abbreviations

Table 1-3: Acronyms and Abbreviations

Acronym	Description
ACSS	Aviation Communication and Surveillance Systems
AIU	Aircraft Interface Unit
ARINC	Aeronautical Radio, Inc.
ATP	Acceptance Test Procedures
BITE	Built-In Test Equipment
CCP	Common Computing Platform
CPA	Common Processor Assembly
CPLD	Complex Programmable Logic Device
CRC	Cyclic Redundancy Check
ECC	Error Checking and Correction
EIT	End Item Test
EPROM	Erasable Programmable Read-Only Memory
EEPROM	Electrically Erasable Programmable Read-Only Memory
ESS	Environment Stress Screening
FPGA	Field Programmable Gate Array
GPS	Global Positioning System
HBM	Heartbeat Monitor
HRD	Hardware Requirements Document
HTS	Hardware Test Software
I ² C	Inter-Integrated Circuit
IC	Integrated Circuit
I/O	Input/Output
JTAG	Joint Test Action Group
LBP	Left Bottom Plug
LRU	Line Replaceable Unit
MMU	Memory Management Unit
P1	Processor 1
P2	Processor 2
P3	Processor 3

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Table 1-3: Acronyms and Abbreviations

Acronym	Description
PC	Personal Computer
PCI	Peripheral Components Interconnect
PDL	Portable Data Loader
PXI	PCI Extensions for Instrumentation
QA	Quality Assurance
RF	Radio Frequency
RFIU	Radio Frequency (RF) Interface Unit
SDRAM	Synchronous Dynamic Random Access Memory
STIV	Switching Threshold Input Voltage
TCAS	Traffic Collision Avoidance System ≈ Airborne Collision Avoidance System
TRD	Test Requirements Document
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
UUT	Unit Under Test
VALFAC	Validation Facility
VSWR	Voltage Standing Wave Ratio
WVT	Working Voltage Threshold

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2 SYSTEM OVERVIEW

The T³CAS Acceptance Test is a fully automated End Item Test that is performed using the ACSS, T³CAS End Item Test Station (P/N 9005039-001). At the End Item level of testing, there are two primary types of software utilized. The first type of software is Hardware Test Software (HTS), which is loaded into FLASH memory of the UUT and executes within the UUT's SDRAM. The second type of software is the End Item Test station program that executes on the End Item Test station PC.

The HTS program receives high level commands from the End Item Test station program via an RS-232 interface. It executes commands and returns a response. The responses returned from HTS may range from acknowledgement of receipt of a command to returning data and/or status of a test that was performed by the embedded software.

The End Item Test station program is comprised of a Test Executive, Instrument Drivers, and Test Functions. The Test Executive, which provides an operator interface, directs test sequencing, determines pass/fail status and enables test report generation. The Instrument Drivers communicate with and control the End Item Test station test equipment via PXI/PCI, IEEE488, and USB interfaces. The Test Functions perform the individual tests that comprise a T³CAS Acceptance Test and are described in the T³CAS TRD, document number 8007547-001.

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3 GENERAL INFORMATION

3.1 General RF Test Requirements

- All antenna ports must be terminated in 50 ohms while power is applied to the UUT.
- Any additional test equipment that may be connected to the antenna ports must have a Voltage Standing Wave Ratio (VSWR) of less than 1.5:1.
- Any additional test equipment that may be connected to the antenna ports shall withstand peak power levels of at least 1000 W and average power levels of at least 2 W.

3.2 Power Requirements

- 115 VAC, 60 Hz, 20 A, standard service power for test equipment operation. All power supplied to the UUT is provided by the test equipment via software controlled rack mounted power supplies.

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4 TEST EQUIPMENT REQUIREMENTS

4.1 Test Equipment Hardware

The T³CAS End Item Test station, P/N 9005039-001, is the test equipment hardware required to perform the tests.

Additional systems' testing is required using the T³CAS System Test Station: P/N 9001041-001, and the TCAS Transmitter Test Fixture: P/N T360096.

4.2 Test Equipment Software

- T³CAS End Item Test Software - P/N 9005108-001. This program executes on the End Item Test station PC and automates the tests that are defined in the T³CAS TRD.
- HTS - This software executes within UUT memory and responds to commands sent by the T³CAS PC Test Software. Refer to Appendix A Software/Firmware Configuration for the HTS Master Media Part Number.
- Valfac Test Software – ClearCase (VALFAC_03 project). This program executes on the VALFAC in conjunction with the RF Simulator as described in Appendix C Systems Testing.
- T³CAS Peak Power Meter Software – P/N 9001056-001. This program automates peak power meter measurements as described in Appendix C Systems Testing.
- Operational Code – This software operates the UUT in a flight configuration and is needed for systems testing. Refer to Appendix A Software/Firmware Configuration for the Operational Software Master Media Part Number.

4.3 Test Equipment / UUT Interconnect

Figure 4-1 shows the End Item Test station setup. The T³CAS End Item Test station Interconnect Wiring Diagram is shown in Figure 4-2. Figure 4-3 shows the T³CAS System Test Station and wiring.

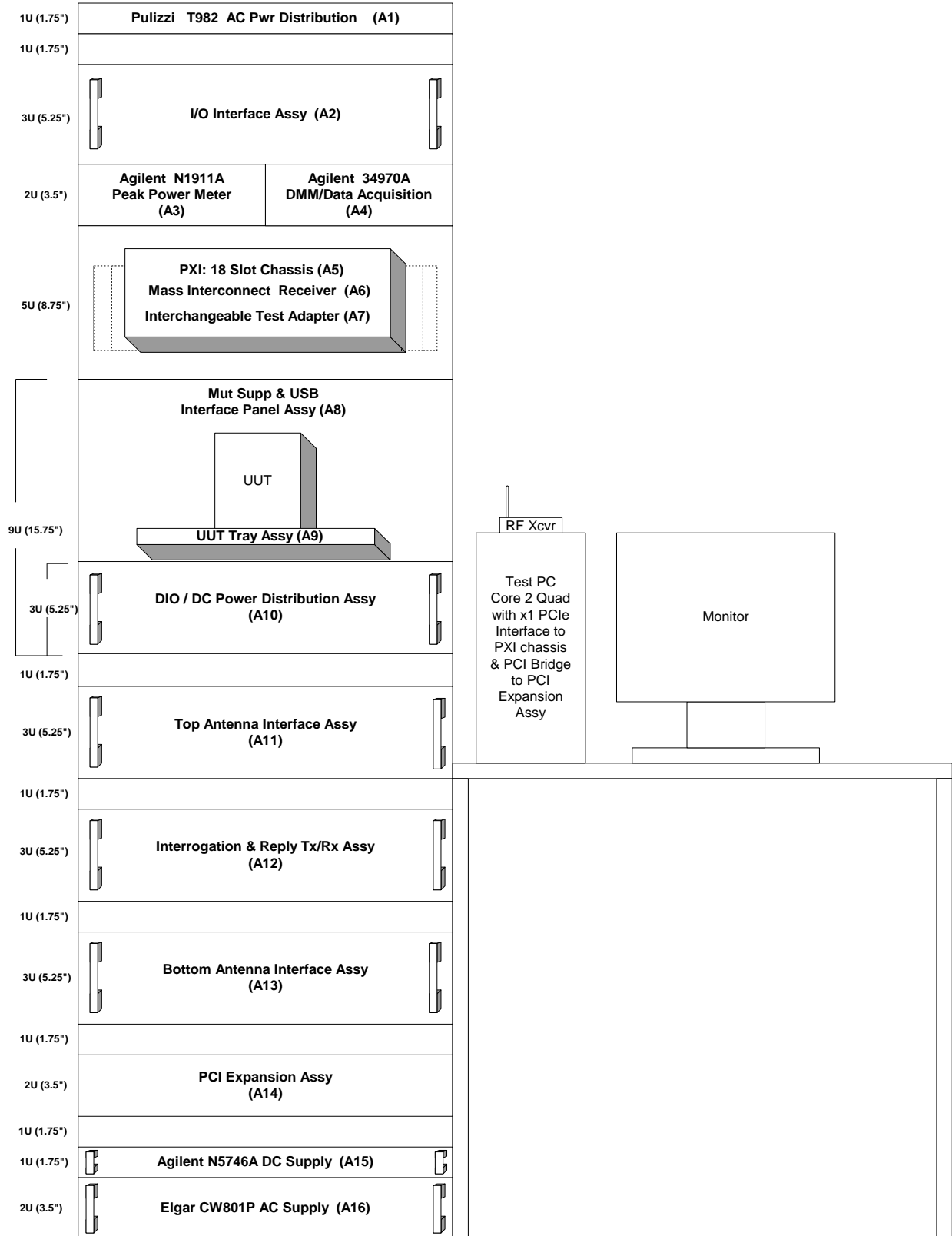


Figure 4-1: T³CAS End Item Test Station

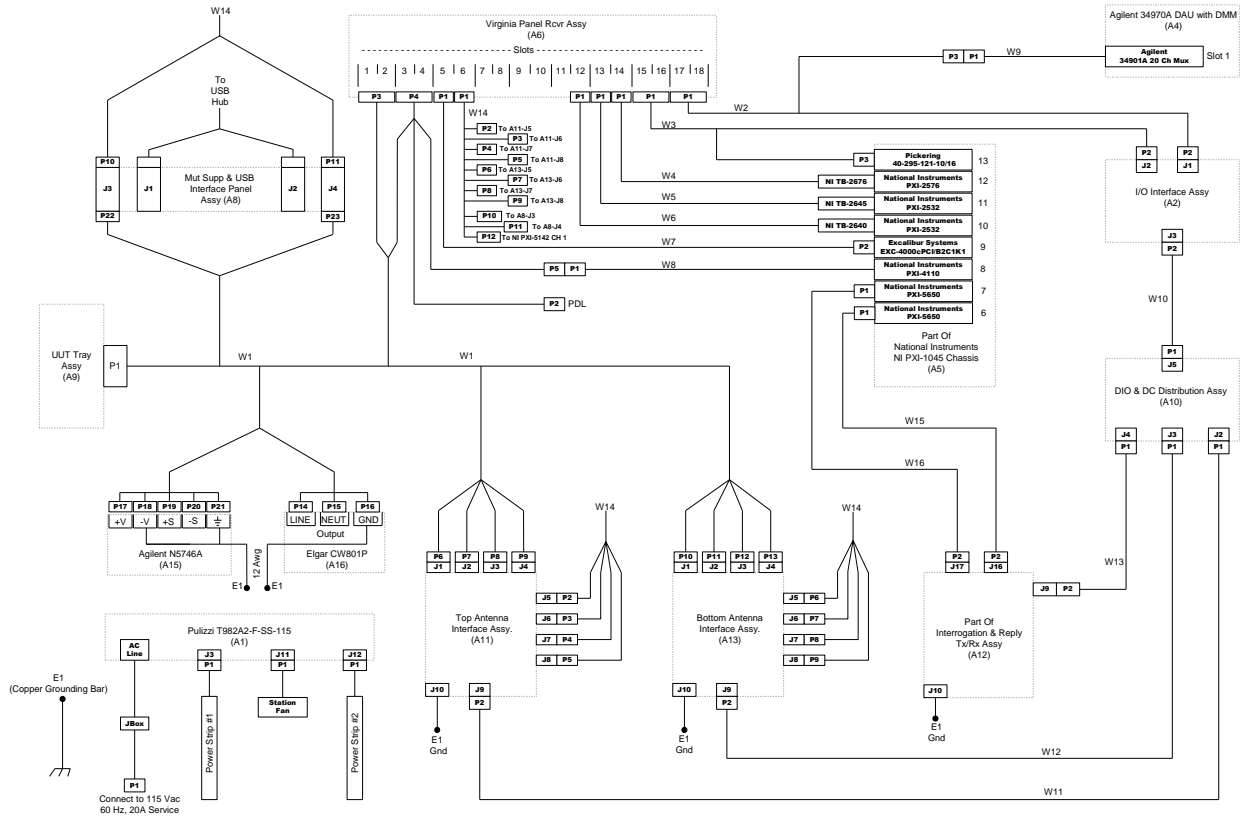
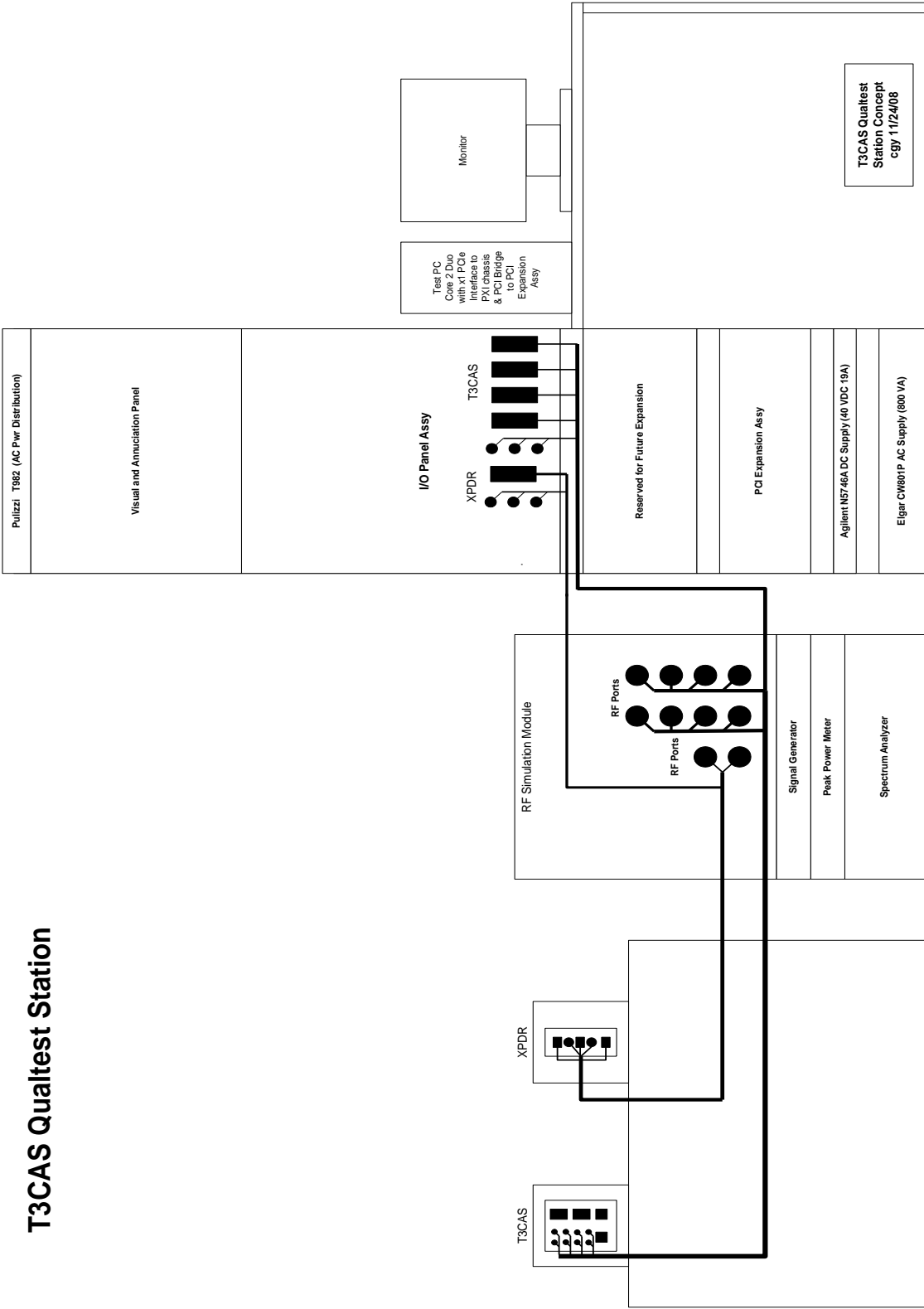


Figure 4-2: End Item Test Station Interconnect Wiring Diagram



T3CAS Qualtest Station

Figure 4-3: T³CAS System Test Station

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5 MANUFACTURING FLOW PROCESS

This section describes the manufacturing flow for T³CAS hardware and software end items, including steps after repair.

5.1 Manufacturing Flow

A. The manufacturing flow is as follows:

- 5.1.1. Bias Calibration of Transmitter CCA
- 5.1.2. Program Processor CCA with software for testing
- 5.1.3. Receiver Filter Tuning
- 5.1.4. Alignment/Calibration of End Item
- 5.1.5. Program/Load End Item with HTS software
- 5.1.6. Test unit with EIT software per section 6.0 or System testing with T3CAS System Test Station – Room Temperature
- 5.1.7. Environment Stress Screening (ESS) – 12 hour
- 5.1.8. Program/Load End Item with final operational software
- 5.1.9. System testing with T3CAS System Test Station – Hot/Cold Temperature
- 5.1.10. Burn-In – 100 hour
- 5.1.11. Test unit with EIT software per section 6.0 or optional not to be performed
- 5.1.12. Program/Load End Item with final operational software, including TAWS and Obstacle Databases
- 5.1.13. Subset System testing with T3CAS System Test Station – Room Temperature
- 5.1.14. Electrical Bonding Interface Test

5.1.1 Bias Calibration of Transmitter CCA

Prior to installing the Transmitter CCA in the End Item UUT, perform initial bias calibration per Section 4 of T³CAS Transmitter CCA Calibration and Test Procedure, document number 8007555-001.

5.1.2 Program Processor CCA with Software for Testing

Prior to installing the Processor CCA in the End Item UUT and performing an End Item Test or End Item Calibration, program Initial Test Software per Section A.2.1 of Appendix A.

5.1.3 Receiver Filter Tuning

Prior to installing the Receiver CCA in the End Item UUT and performing an End Item Test or End Item Calibration, perform TCAS and XPDR Filter Tuning per document 8007770.

5.1.4 Alignment/Calibration of End Item

5.1.4.1 Perform Alignment/Calibration of the End Item UUT

Perform Alignment/Calibration of the End Item UUT, using HTS, per Appendix C: LRU Calibration Procedures.

If LRU Alignment/Calibration is unsuccessful:

- Remove the Receiver CCA from the End Item UUT.

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- Perform Receiver CCA Filter Tuning per document 8007770.
- Re-Install the tuned Receiver CCA in the End Item UUT.
- Perform Alignment/Calibration of the End Item UUT per Appendix C: LRU Calibration Procedures.
- Repeat test steps of Section 5.3 until successful LRU Alignment/Calibration is achieved.

All result files and calibration data is to be backed up to the network drive. This includes capturing via hyperterm both the "RCAL 0 2000 1" and "prncal" commands in separate text files.

5.1.5 Program/Load End Item with Final Operational Software

Program the End Item UUT with operational software, per Section A.2.2 of Appendix A.

5.1.6 Test unit with EIT software per section 6.0 or System testing with T³CAS System Test Station – Room Temperature

Test unit with EIT software per section 6.0 or perform system testing with the T³CAS System Test Station, per Appendix C at room temperature.

5.1.7 Environmental Stress Screening (ESS) – 12 hour

Perform Environmental Stress Screening (ESS) testing per T³CAS ESS Burn-in Procedure, document number 8007573-001.

5.1.8 Program/Load End Item with Final Operational Software

Program the End Item UUT with operational software, per Section A.2.2 of Appendix A.

5.1.9 System Testing with T³CAS System Test Station – Hot/Cold Temperature

5.1.9.1 System Testing at Cold (-55°C) Temperature

Perform system testing at Operating Low Temperature (-55°C) with the T³CAS System Test Station, per Appendix D: System Test FTR with instruction in Appendix C. With the test unit not operating, stabilize the UUT at -55°C ambient for a minimum of 1.5 hours. After the 1.5 hours, power on the LRU and perform the Flight Operations Test (Air) as specified in Appendix C for 30 minutes. Upon completion of this test perform the remaining functional testing as specified in Appendix C.

If the LRU experienced a failure during the low temperature testing and requires only calibration adjustments, perform the calibration update and perform regression testing as needed per Appendix E. If the LRU experienced a failure during the low temperature testing and requires a hardware update (i.e. removing the external cover to perform a component replacement), perform the hardware fix and perform the short ESS profile per the ESS procedure 8007573-001 (Appendix D) prior to repeating the low temperature testing.

Note: Verify that the cooling fan has power applied to it. The cooling fan to the LRU fixture will automatically turn off for temperatures lower than 0°C.

5.1.9.2 System Testing with at Hot (+70°C) Temperature

Perform system testing at Operating High Temperature (+70°C) with the T³CAS System Test Station, per Appendix D: System Test FTR with instruction in Appendix C System Testing .

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If transitioning from room to hot, stabilize the UUT at +70°C ambient for a minimum of 1.0 hours. During the 1.0 hour power on the LRU and perform the Flight Operations Test (Ground) as specified Appendix C System Testing . After Completion of this test, perform the remaining functional testing as specified in Appendix C System Testing.

If transitioning from cold to hot, stabilize the UUT at +70°C ambient for a minimum of 1.5 hours. During the 1.5 hours power on the LRU and perform the Flight Operations Test (Ground) as specified in Appendix C. After Completion of this test, perform the remaining functional testing as specified in Appendix C.

If the LRU experienced a failure during the high temperature testing and requires only calibration adjustments, perform the calibration update perform regression testing as needed per Appendix F. If the LRU experienced a failure during the low temperature testing and requires a hardware update (i.e. removing the external cover to perform a component replacement), perform the hardware fix and perform the short ESS profile per the ESS procedure 8007573-001 (Appendix D) prior to repeating the low temperature testing.

Note: Verify that the cooling fan has power applied to it. The cooling fan to the LRU fixture will automatically turn on for temperatures higher than 0°C.

5.1.9.3 Regression

See Appendix F for regression testing requirements.

5.1.10 Burn-In – 100 hour

Perform the 100 hour burn in per T³CAS ESS Burn-in Procedure, document number 8007573-001.

5.1.11 Test unit with EIT software per section 6.0 or optional not to be performed

Test unit with EIT software per section 6.0 or optional not to be performed

5.1.12 Program/Load End Item with Final Operational Software, including TAWS and Obstacle Databases

Program the End Item UUT with operational software, including TAWS and Obstacle databases, per Section A.2.2 of Appendix A. It is required to use compact flash cards to complete this step.

5.1.13 Subset System Testing with T³CAS System Test Station – Room Temperature

Perform subset of system testing with the T³CAS System Test Station, per Appendix F, at room temperature.

5.1.14 Electrical Bonding Interface Test

5.1.14.1 Bonding Test Description

The ground path between the external chassis and the interconnect ground pin shall be measured and verify not to exceed a resistance value of 0.5 milliohms for every T³CAS units. The below steps show the detailed instructions for measuring the Electrical Bonding Interface test:

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5.1.14.2 Electrical Bonding Interface Test Procedure

- Step 1. The bonding resistance shall be measured using test meter Fluke 8842A with a 4-wire test probe.
- Step 2. Set the test meter to “K-Ω-4wire” setting.
- Step 3. Null out the test probe resistance by shorting the test probe together and simultaneously push “offset” on the test meter.
- Step 4. Insert one test probe (either probe is acceptable) into the rear interconnect ground socket location (RMP-2D) and the other probe to the chassis side wall surface (left or right side wall is acceptable).

Note: Be sure to apply adequate probe pressure to make contact with the bare metal (see Figure 5-1).

- Step 5. The resistance value between the interconnect ground pin and the chassis sidewall shall be less than or equal to 0.5 milliohms. The resistance value shall be recorded as pass or fail on the Work order.

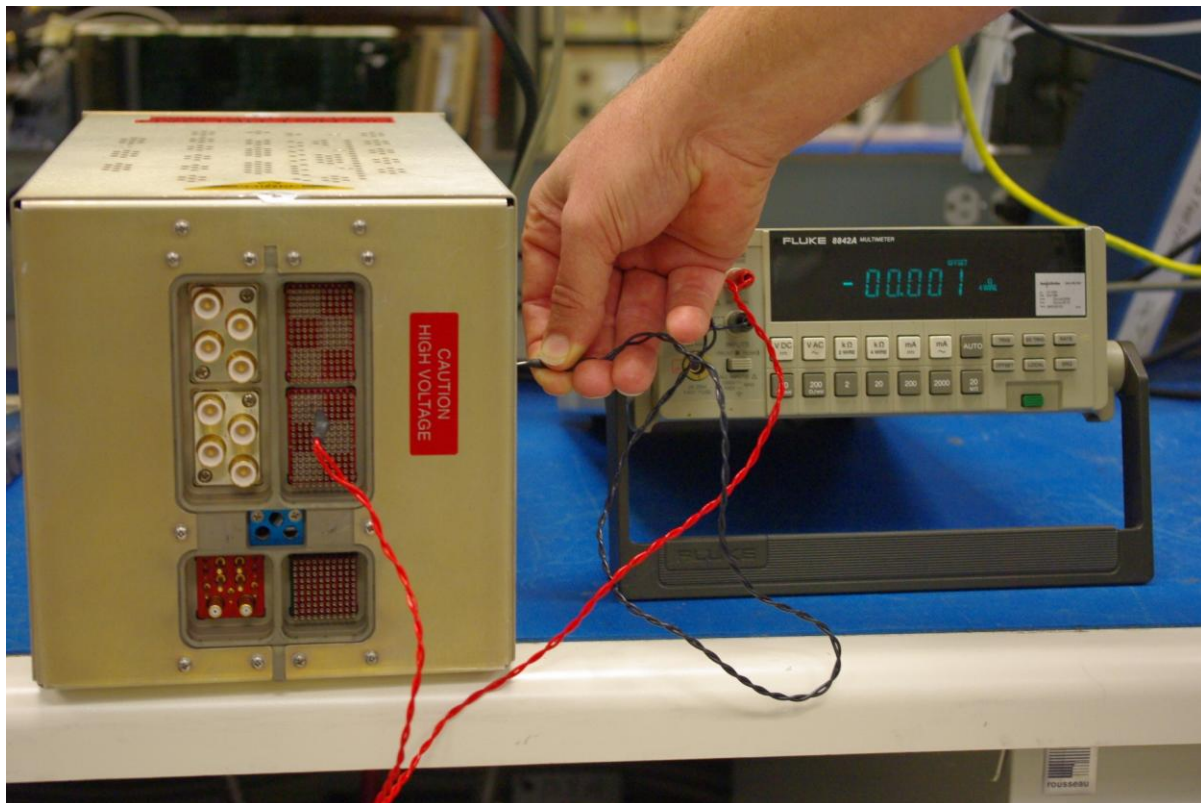


Figure 5-1: T³CAS Electrical Interface Bonding Test

5.2 Minor Repair

A minor repair is defined as a component or select change. The manufacturing process flow for a minor change begins after any calibration that is needed has been performed. The flow is as follows:

1. Regression system testing with T³CAS System Test Station – Room Temperature
2. Environment Stress Screening (ESS) – 3 hour
3. Continue from step 8 of normal manufacturing flow

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5.2.1 Regression System Testing with T³CAS System Test Station – Room Temperature

Perform regression testing with the T³CAS System Test Station, per Appendix C, at room temperature.

5.2.2 Environment Stress Screening (ESS) – 3 Hour

Perform 3 hour Environmental Stress Screening (ESS) testing per T³CAS ESS Burn-in Procedure, document number 8007573-001.

5.2.3 Continue Normal Manufacturing Flow

Continue testing the LRU starting at step 5.1.8 of Section 5.1.

5.3 Major Repair

A major repair is defined as a CCA change. The manufacturing process flow for a major change begins after any calibration that is needed has been performed. The flow starts at step 5.1.5 of Section 5.1 above.

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6 END ITEM TEST

The End Item Test is an optional test used to further analyze the T³CAS LRU. At the End Item Test phase, the T³CAS Computer Unit is tested using HTS software specified in Appendix A Software/Firmware Configuration

6.1 Loading of Embedded Test Software

Ensure that the UUT has successfully been loaded with initial test software per Section 5.1.2, prior to performing End Item hardware testing.

6.2 UUT Alignment/Calibration

Ensure that the UUT is successfully Aligned/Calibrated per Section 5.1.4, prior to performing End Item hardware testing.

6.3 End Item Test Initialization

- Step 1. Power up the ACSS, T³CAS End Item Test station and allow it to warm up for at least 10 minutes. Verify that all of the test equipment is calibrated and is functioning properly.
- Step 2. Insert the UUT into the End Item Test station UUT mount.
- Step 3. Connect the End Item Test station W1 PDL cable to the UUT PDL front panel connector.

6.4 End Item Test Execution

Note: Refer to the T³CAS End Item Test Software, part number 9005108-001, for EIT station software loading instructions.

Note: Refer to the T³CAS End Item Test Software, part number 9005108-001, and T3CAS Test Requirements Document (TRD), part number 8007547-001 section 4.19 Reverse Power Sensor Tests was updated to include squitter forward power fixes.

- Step 1. On the End Item Test station PC, go to C:\9005108\Test\Sequences.
- Step 2. Double click on the file "9005108.seq". Note: This operator must run all the steps and sub steps in this sequence. These steps include the following items:
 - 1) Group 1-2: Standby Input Power Tests
 - 2) Group 4-8: Operator Interactive Tests
 - 3) Group 9-10: Discrete Inputs Tests
 - 4) Group 11-13: Discrete Outputs Tests
 - 5) Group 14: ARINC 429 Tx/Rx Tests
 - 6) Group 15: ARINC 453 Tx Tests
 - 7) Group 16: Traffic Select Decoder Tests
 - 8) Group 17: GPS Time Mark Tests
 - 9) Group 18: PCI Bus Tests

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- 10) Group 19: Comp FPGA Reg Tests
- 11) Group 20: HeartBeat Monitor Tests
- 12) Group 21: Power-Off Timer Tests
- 13) Group 22: SEU Tests
- 14) Group 23: Audio Output Tests
- 15) Group 24: LVDS Interface Tests
- 16) Group 25: Mut Suppression Pulse Tests
- 17) Group 26: Antenna BITE Tests
- 18) Group 27: Rev Pwr Sensor Tests
- 19) Group 29-55: Tcas Xmtr Tests
- 20) Group 56-63: Tcas Rcvr Tests
- 21) Group 64-73: Xpdr Xmtr Tests
- 22) Group 74-96: Xpdr Rcvr Tests

- Step 3. Wait for NI TestStand to launch.
- Step 4. Click "OK" at the login prompt.
- Step 5. Select "Test UUTs" from the "Execute" drop down menu on the main (top) toolbar.
- Step 6. Enter the UUT Serial Number at the UUT Information Prompt.
- Step 7. Upon Clicking on "OK", automatic testing will commence.
- Step 8. Respond to all prompts and instructions that the test program displays during test execution.
- Step 9. A test report will be generated. The test report may be viewed and/or printed at the end of the test sequence from C:\9005108\Test\TestReports.
- Step 10. Verify that all tests have passed.
- Step 11. Disconnect the PDL cable from the UUT.
- Step 12. Remove the UUT from the End Item Test station UUT mount.

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A SOFTWARE/FIRMWARE CONFIGURATION

A.1 INTRODUCTION

Appendix A provides the T³CAS Production End Item Test and Operational Software/Firmware Configuration Tables.

A.1.1 Purpose

- To provide instruction on the loading of images prior to End Item Testing.
- To provide instruction on the loading of Operational Flight Software prior to shipment of the product.

A.2 SOFTWARE / FIRMWARE Configuration AND Verification

A.2.1 Initial Test Configuration Software Loading

Prior to performing an End Item Test station Auto Calibration or End Item Test, the following images must be loaded into the UUT.

- Step 1. Obtain the Master Media Compact Disc (CD) for the images listed in the table(s) below.
- Step 2. Perform the emulator loading procedure described in Appendix A of the T³CAS Test Requirements Document (TRD), document number 8007547-001.

End Item Part Number(s)	T ³ CAS Initial Configuration Test Software/Firmware Master Media P/N: 950003-002D The Compact Disc Master Media Contains The Following Files			
	Description	P/N	File Name	CRC
9005000-10000	P1 Boot	9000907-001	ISP_FL_BP1.BIN	17 8A F8 E1
	P2 Boot	9000908-001	ISP_FL_BP2.BIN	17 8A F8 E1
	P3 Boot	9000909-001	ISP_FL_BP3.BIN	17 8A F8 E1
	P1 Data Loader	9000910-001	ISP_FL_DL1.BIN	FD 6C 30 C1
	P2 Data Loader	9000911-001	ISP_FL_DL2.BIN	BB 56 4E 21
	P3 Data Loader	9000912-001	ISP_FL_DL3.BIN	3D 79 AE 69
	IOC FPGA	9005101-001	T3_IO_01.BIN	78 23 B3 F2
	TCAS FPGA	9005102-002	T3_TC_02.BIN	D2 A3 26 D2
	XPDR FPGA	9005103-001	T3_XP_01.BIN	29 0F 14 7B
	TX FPGA	9005104-002	T3_TX_02.BIN	5B 0F 09 98
	Hardware Info	9005110-001	T3HWINFO_HWI.BIN	82 9A E3 AA
	PC FPGA	9005100-002	9005100_002.BIT	00 1A AB FA
	iMPACT Programming Tool Project File		9005100_PGM.IPF	-----
	iMPACT Programming Tool Part Support File		MPC8245BSDL2.bsd	-----
	iMPACT Programming Tool Part Support File		xc3s5000_fg9002.bsd	-----
	iMPACT Programming Tool Part Support File		xc3s400an_fg4002.bsd	-----

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Note: HTS must initially be programmed using the emulator and CD media after the previous image files have been emulator loaded. After this initial program load occurs, HTS may be programmed at the End Item Test station using the Compact Flash (CF) media.

End Item Part Number(s)	T ³ CAS Hardware Test Software (HTS)				
	Desc.	P/N	File Name	CRC	Master Media P/N
9005000-10000	P1 HTS	9005111-003	T3CASHTS_HT1.BIN	87 24 0C 4B	9500002-003D (use CD when programming using Emulator)
	P2 HTS	9005112-003	T3CASHTS_HT2.BIN	87 24 0C 4B	
	P3 HTS	9005113-003	T3CASHTS_HT3.BIN	87 24 0C 4B	
	P1 HTS	9005111-003	T3CASHTS.HT1	87 24 0C 4B	9500002-003F (use CF when programming using Compact Flash at EIT)
	P2 HTS	9005112-003	T3CASHTS.HT2	87 24 0C 4B	
	P3 HTS	9005113-003	T3CASHTS.HT3	87 24 0C 4B	

A.2.2 Final Configuration Software Loading and Verification

After successful completion of End Item Testing, the following images must be loaded into the UUT.

- Step 1. Obtain the CF Master Media for the images listed in the table(s) below.
- Step 2. Perform Compact Flash data loading of the Operational Software/Firmware via LRU Front Panel.

Note: Loading of the Operational Software/Firmware may be loaded at the Systems Test bench. Note: Please ensure LRU is grounded prior to loading any Operational Software/Firmware.

End Item Part Number(s)	T ³ CAS Operational Software/Firmware Master Media P/N: 9500001-002F The Compact Flash Master Media Contains The Following Files			
	Description	P/N	File Name	CRC
9005000-10000	P1 Operational SW	9000904-002	T3CAS_FL.OP1	1C 35 87 8C
	P2 Operational SW	9000905-002	T3CAS_FL.OP2	71 32 DD 56
	P3 Operational SW	9000906-001	T3CAS_FL.OP3	3F 7A 71 B9
	P1 Data Loader	9000910-001	ISP_FL.DL1	FD 6C 30 C1
	P2 Data Loader	9000911-001	ISP_FL.DL2	BB 56 4E 21
	P3 Data Loader	9000912-001	ISP_FL.DL3	3D 79 AE 69
	IOC FPGA	9005101-001	T3_IO_01.FPG	78 23 B3 F2
	TCAS FPGA	9005102-002	T3_TC_02.FPG	D2 A3 26 D2
	XPDR FPGA	9005103-001	T3_XP_01.FPG	29 0F 14 7B
	TX FPGA	9005104-002	T3_TX_02.FPG	5B 0F 09 98
	AAA	9001077-002	FPAS0059.AAA	9C C3 F0 9E
	Config File	N/A	HEADER.CFG	N/A

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End Item Part Number(s)	T³CAS Terrain Database Master Media P/N: 9100030-003 The Compact Flash Master Media Contains The Following Files			
	Description	P/N	File Name	CRC
9005000-10000	TAWS Database	9001090-003	T3TW1003.TDB	DC 3A A3 DB
	Config File	N/A	HEADER.TXT	N/A

End Item Part Number(s)	T³CAS Obstacle Database Master Media P/N: 9100035-013 The Compact Flash Master Media Contains The Following Files			
	Description	P/N	File Name	CRC
9005000-10000	Obstacle Database	9000381-013	OBSJ1016.ODB	B8 02 DB B5
	Config File	N/A	HEADER.TXT	N/A

A.3 ETHERNET LOADING OF SOFTWARE/FIRMARE OR HTS

During End Item Testing, the following images may be loaded into the UUT to go between HTS and Op-code. This will allow for adjusting calibration of both the TX XPDR and RX TCAS and XPDR settings. Final software loading shall occur using a compact flash card.

Step 1. Login to the Ethernet loading pc. Username: tcatest Password: ACSS team1

Note: There is a space between ACSS and team1.

Step 2. Ensure that the proper Ethernet cable is plugged into the switch and that the other end is plugged into the LRU. The cables are labeled at the switch: system bench 1 is labeled 11 for temp chamber 11, system bench 2 is labeled 115 for temp chamber 115.

Note: Make sure that only the LRU that you want to load is plugged into the switch.

Step 3. Click on "NetLoader" icon on desktop.

Step 4. Verify that LRU is powered on and grounded.

Step 5. If loading T3CAS-HTS, there are two commands that must be performed prior to loading the LRU. The first is to key in "ww ff800000 0900" into the HTS command prompt and then press Enter. The second is to key in "hbf" into the HTS command prompt and then press Enter. Once this is done the LRU will reset and enter data loader mode.

Step 6. Verify connection to LRU by selecting "Discovery" button. Once found click "close". If not found verify setup again.

Step 7. To load software: Click "Upload" button.

Step 8. Select "LTZTCAS" from the targets section.

Step 9. Click "Select Parts".

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Step 10. Choose one of the load options: T3CAS_FULL, T3CAS_OP, T3CAS_OBS, T3CAS_TAWS and T3CAS-HTS.

Step 11. Double click on the desired load.

Step 12. Double click on "MEDIA001" file folder.

Step 13. Select the file and click "open".

Step 14. Select "Loadable Parts" file.

Step 15. Click "add".

Note: The LRU and Part should now be listed under the upload schedule.

Step 16. Click "Upload LSAPs".

Step 17. LRU should then begin loading.

Step 18. Upon completion, close the NetLoader software.

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B LRU CALIBRATION PROCEDURES

The LRU may be calibrated on the EIT Station or manually as listed below. Note that all power references are referenced to the rear of the UUT.

On a computer and at the HTS prompt run DUMPPN. Verify correct HTS and FPGA versions are programmed in the UUT per Appendix A, Section A.2.1.

Use the following procedures to run the EIT Station LRU calibration:

Note: Complete the steps listed in Section 6.3 End Item Test Initialization before proceeding with the following procedures.

Note: Refer to the T³CAS End Item Test Software, part number 9005108-001, for EIT station software loading instructions.

1. On the End Item Test station PC, go to C:\9005108\UutCal\Sequences.
2. Double click on the file "UutCal.seq".
3. Wait for NI TestStand to launch.
4. Click "OK" at the login prompt.
5. Select "Test UUTs" from the "Execute" drop down menu on the main (top) toolbar.
6. Enter the UUT Serial Number at the UUT Information Prompt.
7. Upon clicking "OK", automatic testing will commence.
8. Respond to all prompts and instructions that the test program displays during test execution.
9. A test report will be generated. The test report may be viewed and/or printed at the end of the test sequence from C:\9005108\Test\TestReports.
10. Verify that all tests have passed.
11. Disconnect the PDL cable from the UUT.
12. Remove the UUT from the End Item Test station UUT mount.

Or use the following procedures to run the manual LRU calibration:

Completed	Step	Action
	1	Transfer text file at : C:\9001087.txt using the send function of hyperterm Note: The rev_b_rcvr_cal_constants.txt file is 9001087-001.
	2	Program LRU part number, serial number, mod status using: PPN <LRU#> <Serial#> <mod> Example: PPN 9005000-10000 TQE00212 C
	3	At the HTS prompt run RUNCAL, and follow instructions on screen and hints below. <ol style="list-style-type: none"> a. (49db Step) Adjust the <u>second pulse</u> for 49db on the four top ports. b. (Whisper/Shout Step) Adjust the second pulse for levels indicated on the screen while keeping an eye on the pulse width, it should be around 800ns, anything 810ns or higher means the channel is going into compression. Adjust the phase of the pulses only for the combined steps for the highest amplitude by using the < or > symbols. We do not use the 56db, 55db, 26db and 25db steps. <u>You may not be able to achieve the power requirements on the 56 & 55db steps, this is ok.</u> This adjustment on done on all four top ports.

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Completed	Step	Action
		<p>After all the top ports are adjusted the bottom ports are adjusted using the "+" and "-" keys to get the required power.</p> <p>c. (Omni Cal) Set each pulse for 52.2db on the <u>second pulse</u> while keeping in mind that the pulse width shouldn't go over 520ns. The 180 channel is the problem child as far as making the 52.2db level. You may only be able to get 52.0 db on the 180 with a pulse width of 520ns or slower.</p> <p>d. (Blade Calibration) Skip this by hitting the + key, no blade function is installed yet.</p> <p>e. (Transponder MTL Cal) For each port set the IFR power level to -77dbm and adjust the MTL to achieve at least 90% replies, then follow doc 8007654-001. This checks to make sure we can obtain a 2db margin for temperature testing. Go back to -75dbm on IFR and set the MTL at the regular level.</p> <p>f. (TCAS MTL Cal) Set signal generator at -77dbm and then follow doc 8007654-001. To test receiver for flatness select the manual mode switch and the Rev A switch then select top or bot and the channel you want to test. Click acquire to see % replies at 1090MHZ it should still be set for just over 90% replies, then change signal generator frequency to 1087MHZ. A perfectly tuned filter will remain the same % replies as the 1090MHZ. If not, adjust the signal generator amplitude up or down in power while clicking the acquire button to achieve the same level. Do not adjust the MTL by clicking the + or - buttons because this will change your initial setting. The same is done at 1093MHZ.</p>
	4	Perform XPDR transmitter balancing using XTCAL 15 0 1 for the top four ports and XTCAL 15 1 1 for the bottom four ports. Instructions on how to switch between channels are on the HTS screen. Set each <u>second pulse</u> to 52.2db and do the same for the bottom ports, making sure the pulse width does not go over 520ns. Check each last pulse to ensure that its output power is greater than 51.2db.
	5	Setup Signal Analyzer and Boonton Peak Power meter to look at both the Spectrum and SPR at the same time. Using HTS command RFCAL 11 0 1 2 2 1 this is looking at the 0 top port at the 54db step, measure the width of the SPR divot 1.94db down from the top of the P6 pulse. It should be less than 72ns, if not switch in the second filter by pressing the "]" button, this should bring it in if not you may have to go to the third filter. After the correct SPR time is achieved setup signal analyzer to measure the spectrum at 1030MHZ. Refer to Integrated RF Transmitter Test Requirements Document 8007556-001 for specifications. To adjust the spectrum to pass if it's out of spec which ever port you are currently looking at you increase the power on that port and back off the power on the other port.
	6	Repeat step 5 only change the port to the top 90 degree port and the command to RFCAL 11 1 1 2 2 1
	7	Repeat step 5 only change the port to the top 180 degree port and the command to RFCAL 11 2 1 2 2 1
	8	Repeat step 5 only change the port to the top 270 degree port and the command to RFCAL 11 3 1 2 2 1
	9	Save the calibration data by entering SAVCAL
	10	Enter the command RFWRAP 8 to calculate the self test bearing offsets

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Completed	Step	Action
	11	Output the calibration data and RFWRAP data using the following commands after setting the hyperterm to capture the data DUMPPN PRNCAL RCAL 0 2000 1 RFWRAP 10 0
	12	Stop the capture

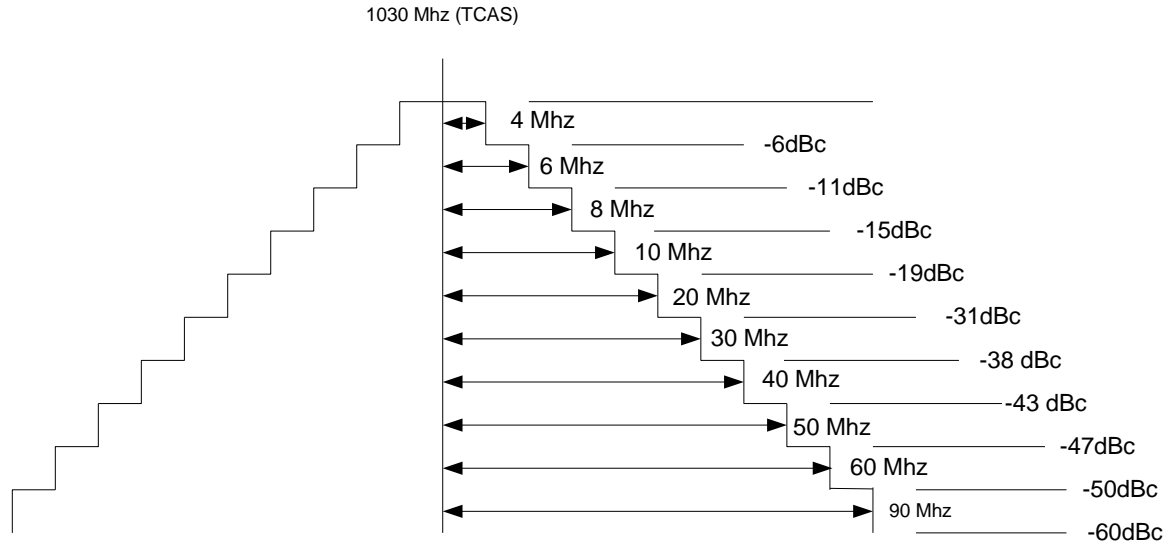
Note: It is permissible to change TX and RX calibration settings while in temp as long as regression testing is performed to ensure full test coverage. This can include but is not limited to receive MTL offsets, transmitter hot and cold forward power constants, and transmitter DAC settings using the wcal command per the HTS TRD 8007545-001.

Spectral mask measurements:

TCAS

1. Connect a spectrum analyzer to the LRU through a 40-dB attenuator. Set up the spectral analyzer as follows:
 - a. Scan Width=20MHz/div (Span=200MHz)
 - b. Resolution Bandwidth=100kHz
 - c. Center Frequency: 1030 MHz
2. Set the transmitter to transmit long Mode-S interrogations with all 1's to the antenna port in Step 1.
3. Check the signal levels relative to the peak signal level (the peak will occur 2MHz away from 1030MHz carrier frequency due to DPSK modulation) so that the requirements below are met.

The emissions spectrum for TCAS interrogations should be within the limits described below:

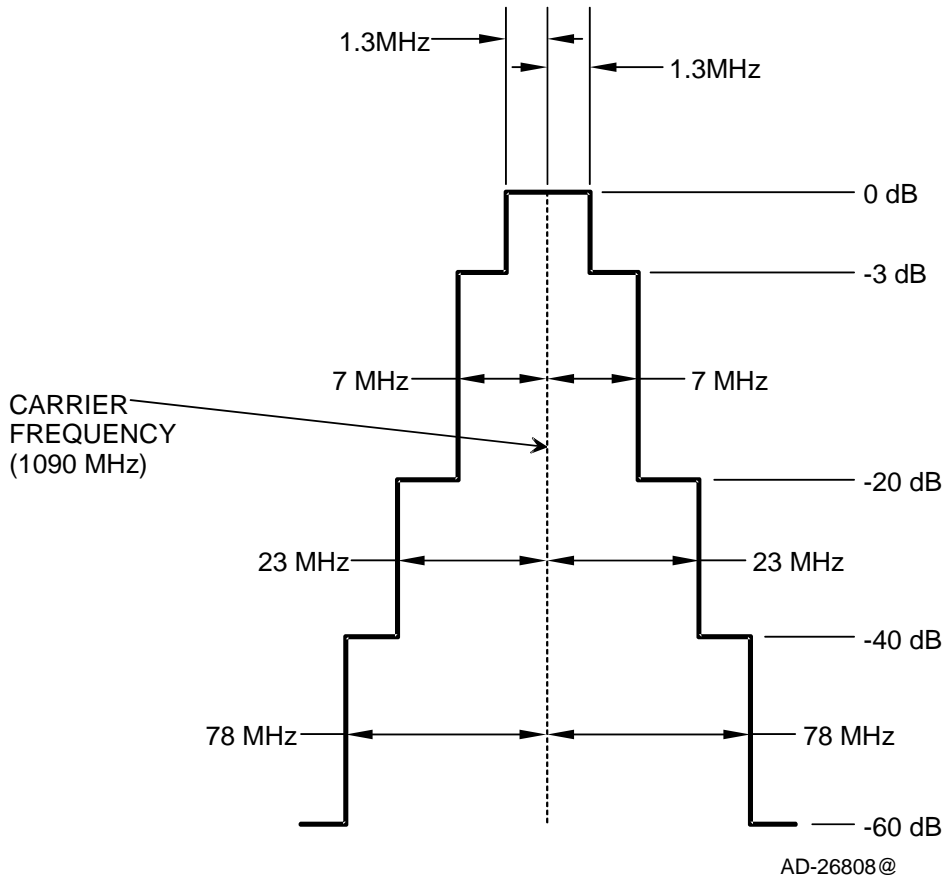


Spectral mask measurements:

Transponder

1. Connect a spectrum analyzer to the LRU through a 40-dB attenuator. Set up the spectral analyzer as follows:
 - a. Scan Width=20MHz/div (Span=200MHz)
 - b. Resolution Bandwidth=100kHz
 - c. Center Frequency: 1090 MHz

2. Set the transmitter to transmit long Mode-S interrogations with all 1's to the antenna port in Step 1.
3. Check the signal levels relative to the peak signal level so that the requirements below are met.



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C SYSTEMS TESTING

C.1 Operation Software Part Number Dump

After loading the operational software, dump the software part numbers. Compare the reported part numbers to the required part numbers in Appendix A, Section A.2.2. If discrepancies are found, reinstall the operational software per Appendix A, Section A.2.2.

Procedure:

1. Open the ACSS RF ValfacGUI tool.
2. Load the single aisle APM configuration. This should be the default (T3CAS_V3_Airbus_SA_CFG1.txt).
3. Click Start.
4. Load the T3CAS_Test.mon. This is done by restoring the "Selected I/O Monitor" tab at the bottom of the screen and then clicking on the "Load" button. When the pop up appears select the T3CAS_Test.mon file. It is then encouraged to minimize all windows other than the "Operations".
5. Set to Test Mode 0. This is done by clicking "TCAS" under "Devices" within the "Operations" window, then selecting the "Discretes" tab, and the changing the "Test Mode Select" to "0 – Flight Operational Mode".
6. Set the front panel to one of the following configurations:
 - a. Configuration 1:
 - i. Internal XPDR to "On"
 - ii. External XPDR to "Standby"
 - iii. Air/Ground discrete to "ground"
 - iv. Control Panel to "XPDR 2" and "TA/RA".
 - b. Configuration 2:
 - i. Internal XPDR to "Standby"
 - ii. External XPDR to "On"
 - iii. Air/Ground discrete to "ground"
 - iv. Control Panel to "XPDR 2" and "TA/RA".
7. Power the UUT.
 - a. Steps for configuration 1 from step 6:
 - i. Turn power on to the UUT.
 - b. Steps for configuration 2 from step 6:
 - i. Turn power on to the UUT.
 - v. After power on is complete set Internal XPDR to "On" and then External XPDR to "Standby"
8. Verify on the VSI/TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages).
9. On the VALFAC PC's desktop, double click on the WebEddit tool.
10. After WebEddit connects, select "CCP Maintenance Interface" from the "Target" drop down menu on the main (top) toolbar.
11. Click on "Fault Logs" and then on "Dump Fault Log".

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12. Save the save the ccp_mifa_dump_fault_log...bin file to the results directory by making a single left click on the hyperlink, click save, and navigating to the appropriate folder. Also upload the .bin file to the “T3CAS Fault Logs” workspace.

Note: When saving this file to the workspace please name the file accordingly: TQEXXXXX_C.1_ENV_dump_fault_log_YYYY_MM_DD_HHmmss Where TQEXXXXX is the serial number of the unit under test, ENV is either Hot, Cold or ROOM. Note: This file will need to be renamed to reflect this format.

13. While still in WebEddit, clear the BITE Fault Log and Event Log.
14. Select “CCP Maintenance Interface” from the “Target” drop down menu on the main (top) toolbar.
15. Click on “Part Numbers”.
16. Copy the part numbers and store in appropriate backup folder.
17. Compare the listed part numbers to the required part numbers listed in Appendix A, Section A.2.2.
18. Close WebEddit.

C.2 Flight Operation Tests

C.2.1 Cold Temperature

The flight operation test checks for RF (TCAS or XPDR) failures in a flight operation environment.

Test Procedure:

1. Open the ACSS RF ValfacGUI tool. If still open from section C.1 skip to step 8.
2. Load the single aisle APM configuration. This should be the default (T3CAS_V3_Airbus_SA_CFG1.txt).
3. Click Start.
4. Load the T3CAS_Test.mon. This is done by restoring the “Selected I/O Monitor” tab at the bottom of the screen and then clicking on the “Load” button. When the pop up appears select the T3CAS_Test.mon file. It is then encouraged to minimize all windows other than the “Operations”.
5. Set to Test Mode 0. This is done by clicking “TCAS” under “Devices” within the “Operations” window, then selecting the “Discretes” tab, and the changing the “Test Mode Select” to “0 – Flight Operational Mode”.
6. Set the front panel to one of the following configurations:
 - a. Configuration 1:
 - i. Internal XPDR to “On”
 - ii. External XPDR to “Standby”
 - iii. Air/Ground discrete to “ground”
 - iv. Control Panel to “XPDR 2” and “TA/RA”.
 - b. Configuration 2:
 - i. Internal XPDR to “Standby”
 - ii. External XPDR to “On”
 - iii. Air/Ground discrete to “ground”

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- iv. Control Panel to “XPDR 2” and “TA/RA”.
7. Power the UUT.
 - a. Steps for configuration 1 from step 6:
 - i. Turn power on to the UUT.
 - b. Steps for configuration 2 from step 6:
 - i. Turn power on to the UUT.
 - ii. After power on is complete set Internal XPDR to “On” and then External XPDR to “Standby”
8. Verify on the VSI/TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages).
9. After 30 minutes, confirm there are no RF (TCAS or XPDR) failures logged.
10. On the VALFAC PC’s desktop, double click on the WebEddit tool.
11. After WebEddit connects, select “CCP Maintenance Interface” from the “Target” drop down menu on the main (top) toolbar.
12. Click on “Fault Log and Event Log” and then on “Dump Active Faults”.
13. Record the number of failures logged into the Systems Test FTR (Appendix D).
14. Select “CCP Maintenance Interface” from the “Target” drop down menu on the main (top) toolbar.
15. Click on "Fault Logs" and then on "Dump Fault Log".
16. Save the save the ccp_mifa_dump_fault_log...bin file to the results directory by making a single left click on the hyperlink, click save, and navigating to the appropriate folder. Also upload the .bin file to the “T3CAS Fault Logs” workspace.

Note: When saving this file to the workspace please name the file accordingly: TQEXXXXX_C.2.1_COLD_dump_fault_log_YYYY_MM_DD_HHmmss Where TQEXXXXX is the serial number of the unit under test. Note: This file will need to be renamed to reflect this format.

17. While still in WebEddit, clear the BITE Fault Log and Event Log.
18. Close WebEddit.
19. Set the front panel to the default setting, except for the following:
 1. Air/Ground discrete to “air”
20. Perform a power cycle and verify that the VSI /TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages) prior to moving on.
21. Press the TEST switch on the control panel.
22. Verify “TCAS TEST” is annunciated and the VSI/TRA displays the test pattern.
23. Verify “TCAS TEST PASS” is annunciated through the speaker.
24. Remove the TOP 0° antenna port from the VALFAC. This is done by flipping the Top 0° switch from “Top 0 Res” to “Top 0 Open.”
25. Verify TCAS FAIL is displayed on the VSI/TRA.

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26. Press the TEST switch on the control panel.
27. Verify "TCAS TEST" is annunciated and the VSI/TRA displays the test pattern.
28. Verify "TCAS LRU PASS, TCAS SYSTEM FAIL" is annunciated through the speaker.
29. Connect the TOP 0° antenna port to the VALFAC. This is done by flipping the Top 0° switch from "Top 0 Open" to "Top 0 Res."
30. Verify on the VSI/TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages).

Note: The antenna phase calibration failure can be ignored as the antenna is not hooked up during these tests. This failure will cause the internal XPDR to fail. Upon inspecting the fault log you will see "XRF: Phase Calibration Monitor, ... Degree 3dB". The channel may change. You should also expect to see "Active transponder is failed".

Note: This test should be performed during the 1.5 hour dwell period and prior to running additional systems tests.

C.2.2 Hot Temperature

The flight operation test checks for RF (TCAS or XPDR) failures in a flight operation environment.

Test Procedure:

1. Open the ACSS RF ValfacGUI tool. If still open from section C.1, change Air/Ground discrete to "air", and skip to step 8.
2. Load the single aisle APM configuration. This should be the default (T3CAS_V3_Airbus_SA_CFG1.txt)
3. Click Start.
4. Load the T3CAS_Test.mon. This is done by restoring the "Selected I/O Monitor" tab at the bottom of the screen and then clicking on the "Load" button. When the pop up appears select the T3CAS_Test.mon file. It is then encouraged to minimize all windows other than the "Operations".
5. Set to Test Mode 0. This is done by clicking "TCAS" under "Devices" within the "Operations" window, then selecting the "Discretes" tab, and the changing the "Test Mode Select" to "0 – Flight Operational Mode".
6. Set the front panel to one of the following configurations:
 - a. Configuration 1:
 - i. Internal XPDR to "On"
 - ii. External XPDR to "Standby"
 - iii. Air/Ground discrete to "ground"
 - iv. Control Panel to "XPDR 2" and "TA/RA".
 - b. Configuration 2:
 - i. Internal XPDR to "Standby"
 - ii. External XPDR to "On"
 - iii. Air/Ground discrete to "ground"
 - iv. Control Panel to "XPDR 2" and "TA/RA".
7. Power the UUT.

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- a. Steps for configuration 1 from step 6:
 - i. Turn power on to the UUT.
- b. Steps for configuration 2 from step 6:
 - i. Turn power on to the UUT.
 - ii. After power on is complete set Internal XPDR to “On” and then External XPDR to “Standby”
8. Verify on the VSI/TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages).
9. After 30 minutes, confirm there are no RF (TCAS or XPDR) failures logged.
10. Set the front panel to the default setting, except for the following:
 - Air/Ground discrete to “ground”
11. On the VALFAC PC’s desktop, double click on the WebEddit tool.
12. After WebEddit connects, select “CCP Maintenance Interface” from the “Target” drop down menu on the main (top) toolbar.
13. Click on “Fault Log and Event Log” and then on “Dump Active Faults”.
14. Record the number of failures logged into the Systems Test FTR (see Appendix D).
15. Select “CCP Maintenance Interface” from the “Target” drop down menu on the main (top) toolbar.
16. Click on "Fault Logs" and then on "Dump Fault Log".
17. Save the save the ccp_mifa_dump_fault_log...bin file to the results directory by making a single left click on the hyperlink, click save, and navigating to the appropriate folder. Also upload the .bin file to the “T3CAS Fault Logs” workspace.

Note: When saving this file to the workspace please name the file accordingly: TQEXXXXX_C.2.2_HOT_dump_fault_log_YYYY_MM_DD_HHmmss Where TQEXXXXX is the serial number of the unit under test. Note: This file will need to be renamed to reflect this format.

18. While still in WebEddit, clear the BITE Fault Log and Event Log.
19. Close WebEddit.
20. Set the front panel to the default setting, except for the following:
 - Air/Ground discrete to “air”
21. Perform a power cycle and verify that the VSI /TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages) prior to moving on.
22. Press the TEST switch on the control panel.
23. Verify “TCAS TEST” is annunciated and the VSI/TRA displays the test pattern.
24. Verify “TCAS TEST PASS” is annunciated through the speaker.
25. Remove the TOP 0° antenna port from the VALFAC. This is done by flipping the Top 0° switch from “Top 0 Res” to “Top 0 Open.”

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26. Verify TCAS FAIL is displayed on the VSI/TRA.
27. Press the TEST switch on the control panel.
28. Verify “TCAS TEST” is annunciated and the VSI/TRA displays the test pattern.
29. Verify “TCAS LRU PASS, TCAS SYSTEM FAIL” is annunciated through the speaker.
30. Connect the TOP 0° antenna port to the VALFAC. This is done by flipping the Top 0° switch from “Top 0 Open” to “Top 0 Res.”
31. Verify on the VSI/TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages).

Note: The antenna phase calibration failure can be ignored as the antenna is not hooked up during these tests. This failure will cause the internal XPDR to fail. Upon inspecting the fault log you will see “XRF: Phase Calibration Monitor, ... Degree 3dB”. The channel may change. You should also expect to see “Active transponder is failed”.

Note: This test should be performed during the 1.0 hour dwell period if starting from room or during the 1.5 hour dwell period if starting from cold and prior to running additional systems tests.

C.3 TCAS (DO-185B) Performance Test Procedures

Table C-1: DO-185B Performance Test Summary

DO-185B Test	Test Description	Comments
2.4.2.1.1.1	Transmit Frequency	Top 0 only
2.4.2.1.1.2 & 2.4.2.1.1.4	Radiated Output Power & Transmit Pulse Characteristics	Mode S only
2.4.2.1.1.3.1	Whisper/Shout Sequence High Density	Subset of tests
2.4.2.1.2.1	In-Band Acceptance	Subset of tests
2.4.2.1.2.2	Out-of-Band Rejection	Subset of tests
2.4.2.1.9.1	Bearing Accuracy	Run at 1090MHz Only

C.3.1 DO-185B Standard Test Setups

C.3.1.1 ValfacGUI Test Setup

Open the ACSS RF ValfacGUI tool.

Load the single aisle APM configuration. This should be the default (T3CAS_V3_Airbus_SA_CFG1.txt).

Click Start.

Load the T3CAS_Test.mon. This is done by restoring the “Selected I/O Monitor” tab at the bottom of the screen and then clicking on the “Load” button. When the pop up appears select the T3CAS_Test.mon file. It is then encouraged to minimize all windows other than the “Operations”.

Set the front panel to the following:

- a) Internal XPDR to “Standby”
- b) External XPDR to “On”

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- c) Air/Ground discrete to “air”
- d) Control Panel to “XPDR 1” and “TA/RA”.

C.3.1.2 ValfacScript setup

Unless otherwise specified in a test, the following standard test conditions shall apply for the DO-185B tests:

- Open the ACSS RF ValfacScript tool and load the single aisle APM configuration.
- Set the number of Mode S intruders to = 150, the number of ATCRBS intruders to = 100, and the number of ground intruders to = 10.
- Set the Valfac to a bottom directional antenna configuration (Switch is located on RF Sim Module).
- Set the control panel to “XPDR 1” and “TA/RA” mode.
- Switch the internal XPDR to “Standby” and the external XPDR to “On.”

C.3.2 Transmit Frequency

This test will verify the transmit frequency of the 1030 MHz transmitter.

Test Procedure:

1. Open the ACSS RF ValfacGUI tool and configure per section C.3.1.1 ValfacGUI test setup.
2. Set to Test Mode 3. This is done by clicking “TCAS” under “Devices” within the “Operations” window, then selecting the “Discrettes” tab, and the changing the “Test Mode Select” to “3 – MOPS Test Mode 3”.
3. Connect the spectrum analyzer to the “Power Meter (PM)” connection on the Valfac. Set the spectrum analyzer to the default settings except for the following:
 - Scan Width: 100 kHz
 - Resolution Bandwidth: 1 kHz
 - Center Frequency: 1030 MHz
4. Power up or cycle power on the UUT.
5. Remove the Top 0° antenna port from the VALFAC. This is done by flipping the Top “PM 0 SEL” switch up.
6. Set the spectrum analyzer to Max hold.
7. Allow the display to fill in to a single line pattern, then measure the spectrum peak on the Top 0° antenna port.
8. Verify the peak is within $\pm .01$ MHz of the reference frequency 1030 MHz. [1.029,990,000 to 1.030,010,000 GHz]
9. Connect the Top 0° antenna port to the VALFAC. This is done by flipping the Top “PM 0 SEL” switch down.

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C.3.3 Radiated Output Power & Transmit Pulse Characteristics

The Radiated Output Power and Transmit Pulse Characteristic tests verify the transmission characteristics of the TCAS 1030 MHz interrogations (Mode S). Pulse amplitude variation, droop, shape, spacing tolerance and DPSK phase reversal timing, duration and tolerance are measured.

Detailed Power Meter Steps will be presented to the user by the power meter software (T3CAS_PPM.exe). Refer to the T³CAS Peak Power Meter software, part number 9001056-001. A help file will be available via the power meter software and the software will prompt the user for critical steps.

Test Procedure:

1. Open the ACSS RF ValfacGUI tool and configure per section C.3.1.1 ValfacGUI test setup.
2. Set to Test Mode 2. This is done by clicking “TCAS” under “Devices” within the “Operations” window, then selecting the “Discretets” tab, and the changing the “Test Mode Select” to “2 – MOPS Test Mode 2”.
3. Power up or cycle power on the UUT.
4. Open the T3CAS_PPM software program.
5. Enter test information.
 - a. Test Engineer
 - b. Test Environment (Room, Cold or Hot)
 - c. LRU Serial Number
6. Under measurement type select “TCAS – Mode S”
7. Ensure that the VISA Resource Name is set to GPIB0::13::INSTR for Power Meter GPIB address of 13 or GPIB0::14::INSTR for Power Meter GPIB address of 14.
8. Click “Start” and follow on screen prompts.
9. When the Measurement Status window indicates “Ready”, open windows explorer and navigate to C:\T3CAS_PPM\EXE\T3CAS_PPM\Results.
10. Open the following files and verify that no tests failed:
 - Mode_S_0_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 - Mode_S_0_BOT_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 - Mode_S_90_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 - Mode_S_90_BOT_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 - Mode_S_180_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 - Mode_S_180_BOT_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 - Mode_S_270_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 - Mode_S_270_BOT_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
11. Record the number of passing tests from each file into the Systems Test FTR (Appendix D).
12. Ensure that all data is stored in the necessary network folder.

Note: The power meter tool will prompt to change antenna port switch settings. When test is complete return all antenna switches to the down position.

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Note: If a failure is present, select the “SCREEN CAPTURE” button and re-run the test. This will allow capture screen shots of the results for review.

C.3.4 Whisper Shout Sequence

The Whisper Shout Sequence measures the S1, P1, P3 and P4 of the whisper shout steps. This data is then used to verify pulse requirements are within specification.

Detailed Power Meter Steps will be presented to the user by the power meter software (T3CAS_PPM.exe). Refer to the T³CAS Peak Power Meter software, part number 9001056-001. A help file will be available via the power meter software and the software will prompt the user for critical steps.

Test Procedure:

1. Open the ACSS RF ValfacGUI tool and configure per section C.3.1.1 ValfacGUI test setup.
2. Set to Test Mode 10. This is done by clicking “TCAS” under “Devices” within the “Operations” window, then selecting the “Discretes” tab, and the changing the “Test Mode Select” to “10 – High-Resolution Whisper Shout”.
3. Power up or cycle power on the UUT.
4. Open the T3CAS_PPM software program.
5. Enter test information.
 - a. Test Engineer
 - b. Test Environment (Room, Cold or Hot)
 - c. LRU Serial Number
6. Under measurement type select “TCAS – WS_8_STEP_Factory”
7. Ensure that the VISA Resource Name is set to GPIB0::13::INSTR for Power Meter GPIB address of 13 or GPIB0::14::INSTR for Power Meter GPIB address of 14.
8. Click “Start” and follow on screen prompts.
9. When the Measurement Status window indicates “Ready”, open windows explorer and navigate to C:\T3CAS_PPM\EXEC\T3CAS_PPM\Results.
10. Open the following file and verify that no tests failed:

8_WS_STEP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
11. Record the number of passing tests from each file into the Systems Test FTR Appendix D).
12. Ensure that all data is stored in the necessary network folder.

Note: All antenna ports must be connected to the power meter during this test and then switched back when test is complete

Note: If a failure is present, select the “SCREEN CAPTURE” button and re-run the test. This will allow capture screen shots of the results for review.

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C.3.5 TCAS Receiver MTL Calibration Procedure

This test is used for trouble shooting purposes only. It assists with determining the TCAS ModeS and ATCRBS MTL's for the LRU. This test should be run when having issues with In-Band Acceptance tests.

The MTL test script injects intruders on each of the ports at RF levels from -72 to -76 in 1dB steps. At each RF level, the Mode S test runs for 20 seconds, which results in $20 \times 5 = 100$ replies to be received on each port. The Mode C test runs for 25 seconds, which results in $25 \times 4 = 100$ replies to be received on each port. From the test results, the % valid replies at each RF level would be calculated for each port. The RF level which is closest to 90% would be chosen as the reference level. Note each of the 4 ports will have an independent MTL reference level value. The RF level is then added to the .scp file.

Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario ModeS_MTL_Test.scp.
2. When the test is finished, analyze the results file C:\VALFAC_03_Load_2 forQual\Script_batch\users\\ModeS_MTL_Test<date time>.rst to find the Mode S MTL for each port. In results file Enter Control F and search for valid to find received intruders.
3. Pass Criteria: Verify the Mode S MTL for each port is 74 ± 2 dBm.
4. Record the MTL for each port in the Systems Test FTR (Appendix D).
5. Reset the ACSS RF ValfacScript tool and run the scenario ATCRBS_MTL_Test.scp.
6. When the test is finished, analyze the results file C:\VALFAC_03_Load_2 forQual\Script_batch\users\\ATCRBS_MTL Test<date time>.rst to find the ATCRBS MTL for each port. In results file Enter Control F and search for valid to find received intruders.
7. Pass Criteria: Verify the ATCRBS MTL for the 0,90 and 270 ports are 74 ± 2 dBm.
8. Record the MTL for each port in the Systems Test FTR (Appendix D).

Note: The MTL for the 180 port is higher than -74 dBm, due to the software algorithm which desensitizes the receiver.

Note: The MTL test for both ATCRBS and ModeS are to be used for troubleshooting and are not required to be performed.

C.3.6 In-Band Acceptance (DO-185B 2.4.2.1.2.1)

This test verifies that the UUT correctly receives Mode C and Mode S replies that meet power and frequency requirements.

This test uses a test procedure which is equivalent to the MOPS tests, and tests the requirements in a time efficient manner. The MOPS tests are based on running a scenario in which 4 ATCRBS replies or 3 Mode S Squitters for an intruder are generated for consecutive surveillance intervals (whisper/shout sequences or squitter listening periods). The test determines if an RA was generated or not. The method used for this test uses the internal data recording capability of the unit in order to verify the reception of each Mode C reply or Mode S Squitter. Since the reply probability of each individual reply can be determined, using the statistical confidence methods in the MOPS is not required.

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C.3.6.1 Mode C Tests (DO-185B 2.4.2.1.2.1)

For each of the RF levels, the test injects 4 Mode C replies per second on 3 antenna ports (0, 90, and 270). After injecting the replies, the data recorder output is examined to determine the replies were received and decoded correctly by counting the number of received intruders with the correct Mode C code. During the test, the unit is set to a test mode which inhibits TCAS transmissions and allows the unit to receive Mode C replies. The following Mode C intruders are used:

Antenna Port	Mode C Intruder Code
0 deg	60FA
90 deg	6042
270 deg	60D2

Each of the 3 antenna ports is tested independently to determine it has the required decoding probability. The test is run with the T³CAS Receiver Filter set to the wide-band filter mode (Test Mode #7 – Functional Test Facilities Mode).

Test Procedure:

1. Set the front panel to the following:

Air/Ground discrete to “air”
Landing Gear discrete to “gear up”

2. In the ACSS RF ValfacScript tool, run the scenario DO-185B_2.4.2.1.2.1_ATCRBS_freq.scp.
3. Pass Criteria: When the test is finished, analyze the results file C:\VALFAC_03_Load_2 forQual\Script_batch\users\\DO-185B_2.4.2.1.2.1_ATCRBS_freq<date time>.rst.

NUMBER OF TESTS PASSED = 6
NUMBER OF TESTS FAILED = 0

4. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):
5. Reset the ACSS RF ValfacScript tool and run the scenario DO-185B 2.4.2.1.2.1_ATCRBS_Factory.scp.
6. Pass Criteria: When the test is finished, analyze the results file C:\VALFAC_03_Load_2 forQual\Script_batch\users\\DO-185B 2.4.2.1.2.1_ATCRBS_Factory.scp<date time>.rst.

NUMBER OF TESTS PASSED = 15
NUMBER OF TESTS FAILED = 0

7. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):

C.3.6.2 Mode S Tests (DO-185B 2.4.2.1.2.1)

For each of the RF levels, the test injects 16 Mode S replies per second in each of the 4 antenna ports (0, 90, 180, 270). After injecting the replies, the data recorder output is examined to determine the replies were received and decoded correctly by counting the number of received intruders with the correct Mode S Address. During the test, the unit is set to a test mode which inhibits TCAS transmissions and allows the unit to receive Mode S replies. The following Mode S intruders are used for each of the 4 antenna ports:

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<u>Antenna Port</u>	<u>Mode S Address</u>
0 deg	100000 ... 10000F
90 deg	200000 ... 20000F
180 deg	300000 ... 30000F
270 deg	400000 ... 40000F

Each of the 4 antenna ports is tested independently to determine it has the required decoding probability. All tests listed in 2.4.2.1.2.1 are run with the T³CAS Receiver Filter set to the wide-band filter mode (Test Mode #7 – Functional Test Facilities Mode).

Test Procedure:

1. Reset the ACSS RF ValfacScript tool and run the scenario DO-185B_2.4.2.1.2.1_NB_Factory.scp.
2. Pass Criteria: When the test is finished, analyze the results file C:\VALFAC_03_Load_2 forQual\Script_batch\users\\ DO-185B_2.4.2.1.2.1_NB_Factory.scp<date time>.rst.
NUMBER OF TESTS PASSED = 20
NUMBER OF TESTS FAILED = 0
3. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):

C.3.7 Out-of-Band Rejection (DO-185B 2.4.2.1.2.2)

This test uses a test procedure which is equivalent to the MOPS tests, and tests the requirements in a time efficient manner. The MOPS tests are based on running a scenario in which 4 ATCRBS replies or 3 Mode S Squitters for an intruder are generated for consecutive surveillance intervals (whisper/shout sequences or Squitter listening periods). The test determines if an RA was generated or not. The method used for this test uses the internal data recording capability of the unit in order to verify the reception of each Mode C reply or Mode S Squitter. Since the reply probability of each individual reply can be determined, using the statistical confidence methods in the MOPS is not required.

C.3.7.1 Mode C Tests (DO-185B 2.4.2.1.2.2)

The test injects 4 Mode C replies per second on 3 antenna ports (0, 90, and 270). After injecting the replies, the data recorder output is examined to determine the replies were received and decoded correctly by counting the number of received intruders with the correct Mode C code. During the test, the unit is set to a test mode which inhibits TCAS transmissions and allows the unit to receive Mode C replies. The following Mode C intruders are used for each of the 3 antenna ports:

<u>Antenna Port</u>	<u>Mode C Intruder Code</u>
0 deg	60FA
90 deg	6042
270 deg	60D2

Each of the 3 antenna ports is tested independently to determine it has the required decoding probability.

The test procedure first requires the actual MTL reference level for each individual port to be determined as defined in section C.3.2. Scenarios A through H using the MTL reference levels are run. Each scenario will be run for 40 seconds, which results in a total of 160 replies per port per RF level. The scenario passes if the percent of valid replies decoded (which have the correct Mode C code) is less than or equal to 90%. The test is run with the T³CAS Receiver Filter set to the wide-band filter mode (Test Mode #7 – Functional Test Facilities Mode).

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Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario DO-185B_2.4.2.1.2.2_ATCRBS_Factory.scf.
2. Pass Criteria: When the test is finished, analyze the results file C:\VALFAC_03_Load_2 forQual\Script_batch\users\\DO-185B_2.4.2.1.2.2_ATCRBS_Factory.scf<date time>.rst.

NUMBER OF TESTS PASSED = 6
NUMBER OF TESTS FAILED = 0
3. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):

C.3.8 Bearing Accuracy (DO-185B 2.4.2.1.9.1)

The test generates 8 Mode C Intruders at various ranges up to 5 nmi and varied altitudes, so TCAS does not overlap the intruders. The first script has intruders spaced at 45 degree bearing intervals starting at 0 degrees. The second script has intruders spaced at 45 degree bearing intervals starting at 15 degrees. The last script has intruders spaced at 45 degree bearing intervals starting at 30 degrees. Table C-2 defines the intruder spacing:

Table C-2: Bearing Accuracy Intruders

Intruder	Bearing (deg)	Range (nmi)	Altitude (ft)
1	0	5	9,600
2	15	5	9,600
3	30	5	9,600
4	45	4	10,100
5	60	4	10,100
6	75	4	10,100
7	90	3	10,600
8	105	3	10,600
9	120	3	10,600
10	135	2	11,100
11	150	2	11,100
12	165	2	11,100
13	180	1	11,600
14	195	1	11,600
15	210	1	11,600
16	225	2	9,100
17	240	2	9,100
18	255	2	9,100
19	270	3	8,600
20	285	3	8,600
21	300	3	8,600
22	315	4	8,100
23	330	4	8,100
24	345	4	8,100

This test uses a test procedure which is equivalent to the MOPS tests, and tests the requirements in a more time efficient manner. Each script runs for 45 seconds, so the test runs for a total 135 seconds which allows

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the bearing for the intruders to stabilize. At the end of the period, the filtered bearing for each of the intruder is checked by using the DO-185B_2.4.2.1.9.1_xxxx_Macro.xls, where xxxx is the frequency. The test is run at 1090MHz with the T³CAS Receiver Filter set to the wide-band filter mode, which is always used for Mode C reception (Test Mode #7– Functional Test Facilities Mode).

Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario DO-185B_2.4.2.1.9.1_1090a.scf. At the user prompt, record ATCRBS Track data through WebEddit. Upon completion of the test decode the data and save the SaTrack file in C:\Bearing as SaTrack 1090a.
2. Reset the ACSS RF ValfacScript tool and run the scenario DO-185B_2.4.2.1.9.1_1090b.scf. At the user prompt, record ATCRBS Track data through WebEddit. Upon completion of the test decode the data and save the SaTrack file in C:\Bearing as SaTrack 1090b.
3. Reset the ACSS RF ValfacScript tool and run the scenario DO-185B_2.4.2.1.9.1_1090c.scf. At the user prompt, record ATCRBS Track data through WebEddit. Upon completion of the test decode the data and save the SaTrack file in C:\Bearing as SaTrack 1090c.
4. Pass Criteria: Use the DO-185B_2.4.2.1.9.1_1090_Macro.xls to verify the following pass criteria:
5. The peak filtered bearing error of each intruder shall be < 8 degrees
6. Record the peak filtered bearing error from the macro in the Systems Test FTR (Appendix D).

Note: Ensure the SaTrack.csv and macro file are in the correct directory structure: C:\Bearing. Use ctrl-z to invoke the macro. After the save process is completed, copy the results file into the required directory.

C.4 Mode S Transponder (DO-181C) Performance Test Procedures

Table C-3: Mode S Transponder (DO-181C) Test Summary

DO-181C Test	Test Description	Comments
2.3.2.1	Receiver Characteristics	
2.3.2.2.1	Reply Transmission Frequency	Run automated power meter test
2.3.2.2.2	RF Peak Power Output	Run automated power meter test
2.3.2.4	Side Lobe Suppression	Step 1-3 only
2.3.2.5	Pulse Decoder Characteristic	Steps 1,2 and 6 only
2.3.2.7	Standard Interference Pulse	Subset of tests
2.3.2.10	Diversity Operation	Subset of tests

Note: During certain DO-181C tests it is permissible for the tester to average the result to verify greater than 99% passing. This is due to a limitation within the script tool verification.

C.4.1 DO-181C Standard Test Setup

C.4.1.1 ValfacScript setup

Unless otherwise specified in a test, the following standard test conditions shall apply for the DO-181C tests:

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- Open the ACSS RF ValfacScript tool and load the single aisle APM configuration.
- Set the number of Mode S intruders to = 150, the number of ATCRBS intruders to = 100, and the number of ground intruders to = 10.
- Set the Valfac to a bottom directional antenna configuration (Switch is located on RF Sim Module).
- Set the control panel to “XPDR 2” and “XPDR Only” mode.
- Switch the internal XPDR to “On” and the external XPDR to “Standby”.

C.4.2 Receiver Characteristics (DO-181C 2.3.2.1)

For each test in this section, the RF level is referenced to the antenna, with a 3 dB cable loss between the antenna and the unit.

Note: This test includes the following DO-181C tests:

- 2.3.2.3.1 Step 2 – ATCRBS Reply Delay and Jitter
- 2.3.2.3.2 Step 1 – Mode S Reply Delay and Jitter
- 2.3.2.3.2 Step 2 – ATCRBS/Mode S All Call Reply Delay and Jitter

Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario DO181C_2321_step1_updt.scp.
2. Pass Criteria: Examine the file `\Script_batch\users\. For each of the 3 frequencies, record the lowest RF level which has >90% replies (Test Passes) in the Systems Test FTR (Appendix D).`
3. Verify that the maximum RF level and the minimum RF level for the 3 frequencies are within 1dB of each other and record the number passing in the Systems Test FTR (Appendix D).
4. In the ACSS RF ValfacScript tool, run the scenario DO181C_2321_step2_updt.scp.
5. Pass Criteria: Examine the file `\Script_batch\users\. RF level of -75dBm should have <90% replies and RF level of -69dBm should have >90% replies (at least 18 out of 20 100msec steps in the 2sec span should PASS).`

NUMBER OF TESTS PASSED = 16
NUMBER OF TESTS FAILED = 0

6. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):
7. In the ACSS RF ValfacScript tool, run the scenario DO181C_2321_step3_updt.scp.
8. Pass Criteria: Examine the file `\Script_batch\users\. Verify that all RF levels has >90% ATCRBS and ModeS replies on each Top Port (at least 18 out of 20 replies). For the Reply Delay and Jitter, verify 20 out of 20 100msec steps pass the ATCRBS Average Delay and ATCRBS Jitter criteria in the 2sec span. Also verify 20 out of 20 100msec steps pass the ModeS Average Delay and ModeS Jitter criteria in the 2sec span.`

NUMBER OF TESTS PASSED = 30
NUMBER OF TESTS FAILED = 0

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9. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):
10. In the ACSS RF ValfacScript tool, run the scenario DO181C_2321_step4_updt.scp.
11. Pass Criteria: Examine the file `\Script_batch\users\\DO181C_2321_step4_updt_<date time>.rst`. Verify 20 out of 20 100msec steps on the Top 0 port have <10% ATCRBS and Mode S replies in the each 2 second span.
NUMBER OF TESTS PASSED = 2
NUMBER OF TESTS FAILED = 0
12. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):
13. In the ACSS RF ValfacScript tool, run the scenario DO181C_2321_step5_updt.scp.
14. Pass Criteria: Examine the file `\Script_batch\users\\DO181C_2321_step5_updt_<date time>.rst`. Verify that an RF level of -75dBm has <90% replies for each 100msec step in the 2sec span (20 out of 20).
NUMBER OF TESTS PASSED = 16
NUMBER OF TESTS FAILED = 0
15. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):
16. In the ACSS RF ValfacScript tool, run the scenario DO181C_2321_step6_updt.scp.
17. Pass Criteria: Examine the file `\Script_batch\users\\DO181C_2321_step6_updt_<date time>.rst`. Verify all 8 Top and Bottom ports on each Power level have >99% Mode S replies for each 100msec step in the 2sec span (20 out of 20). Verify Top 0 port, at specified RF levels, has an Average Delay between 127.5 usec and 128.5 usec for each 100msec step in the 2sec span (20 out of 20 pass). Verify Top 0 port, at specified RF levels, has Delay Jitter that is <0.16usec for each 100msec step in the 2 second span (20 out of 20 pass).
NUMBER OF TESTS PASSED = 30
NUMBER OF TESTS FAILED = 0
18. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):
19. In the ACSS RF ValfacScript tool, run the scenario DO181C_2321_step7_updt.scp.
20. Pass Criteria: Examine the file `\Script_batch\users\\DO181C_2321_step7_updt_<date time>.rst`. Verify for each 100msec step in the 2sec span an RF level of -79dBm has <10% ModeS replies (20 out of 20 pass).
NUMBER OF TESTS PASSED = 1
NUMBER OF TESTS FAILED = 0
21. Verify the test result of the script and record the number passing in the Systems Test FTR (Appendix D):

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C.4.3 Side Lode Suppression (DO-181C 2.3.2.4)

Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario DO181C_2324_step1_2_3_updt.scp.
2. Pass Criteria: Examine the file
`\\Script_batch\users\. Verify that each RF level has < 1% ATCRBS replies at each 100msec step in the 2 sec window (20 out of 20 Pass). For step 3, verify that each RF level has >90% ATCRBS replies at each 100msec step in the 2sec window (20 out of 20 Pass).`

NUMBER OF TESTS PASSED = 8

NUMBER OF TESTS FAILED = 0

3. Verify the test result of the script and record the number of passing tests into the Systems Test FTR (Appendix D):

C.4.4 Pulse Decoder Characteristics (DO-181C 2.3.2.5)

Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario DO181C_2325_step1_updt.scp.
2. Pass Criteria: Examine the file `\\Script_batch\users\. Verify that RF level attenuation of 1dB and 6dB have >90% Mode S replies at each 100msec step in a 2 sec span (20 out of 20 pass).`

NUMBER OF TESTS PASSED = 2

NUMBER OF TESTS FAILED = 0

3. Verify the test result of the script and record the number of passing tests into the Systems Test FTR (Appendix D).
4. In the ACSS RF ValfacScript tool, run the scenario DO181C_2325_step2_updt.scp.
5. Pass Criteria: Examine the file `\\Script_batch\users\. Verify that an RF level attenuation of 1dB has <10% replies at each 100msec step in a 2 sec span (20 out of 20 pass). Also, verify that an RF level attenuation of 6dB has >90% ATCRBS reply at each 100msec step in a 2 second span (20 out of 20 pass).`

NUMBER OF TESTS PASSED = 2

NUMBER OF TESTS FAILED = 0

6. In the ACSS RF ValfacScript tool, run the scenario DO181C_2325_step6_updt.scp.
7. Pass Criteria: Examine the file `\\Script_batch\users\. Verify at an SPR deviation from -0.05 and +0.05 micro-second there is >99% Mode S replies at each 100msec step in a 2 sec span (20 out of 20 pass). Also, Verify at an SPR deviation from -0.2 and +0.2 micro-second there is <1% Mode S replies at each 100msec step in a 2 sec span (20 out of 20 pass).`

NUMBER OF TESTS PASSED = 12

NUMBER OF TESTS FAILED = 0

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- Verify the test result of the script and record the number of passing tests into the Systems Test FTR (Appendix D):

C.4.5 Standard Interference Pulse (DO-181C 2.3.2.7)

Test Procedure:

- In the ACSS RF ValfacScript tool, run the scenario DO181C_2327_updt_Factory.scp.
- Pass Criteria: Examine the file `\\Script_batch\users\\DO181C_2327_updt_Factory.scp<date time>.rst`. For steps 2a and 2c, verify $\leq 10\%$ Mode S replies for each 100msec step in the 2 sec span (20 out of 20 pass). For steps 2b and 2d, verify $\geq 99\%$ for each 100msec step in the 2 sec span (20 out of 20 pass).

NUMBER OF TESTS PASSED = 4

NUMBER OF TESTS FAILED = 0

- Verify the test result of the script and record the number of passing tests into the Systems Test FTR (Appendix D):

C.4.6 Diversity Operation (DO-181C 2.3.2.10)

Test Procedure:

- In the ACSS RF ValfacScript tool, run the scenario DO181C_23210_updt_Factory.scp.
- Pass Criteria: Examine the file `\\Script_batch\users\\DO181C_23210_updt_Factory.scp<date time>.rst`.

NUMBER OF TESTS PASSED = 12

NUMBER OF TESTS FAILED = 0

- Verify the test result of the script and record the number of passing tests into the Systems Test FTR (Appendix D):

C.4.7 Reply Transmission Frequency (DO-181C 2.3.2.2.1)

For Transmitter Power Measurements, the RF level is referenced to the unit's antenna RF connector.

Note: This test only includes the following DO-181C test:

2.3.2.2.2 *Step 2 – Mode S Power Output*

This test includes the following DO-260A tests:

2.3.2.2.2 *Pulse Shapes*

Detailed Power Meter Steps will be presented to the user by the power meter software (T3CAS_PPM.exe). A help file will be available via the power meter software and the software will prompt the user for critical steps.

Test Procedure:

- Open the T3CAS_PPM software program.

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2. Enter test information.
 - a. Test Engineer
 - b. Test Environment (Room, Cold or Hot)
 - c. LRU Serial Number
3. Under measurement type select “XPDR – Mode S_Factory”
4. Ensure that the VISA Resource Name is set to GPIB0::13::INSTR for Power Meter GPIB address of 13 or GPIB0::14::INSTR for Power Meter GPIB address of 14.
5. Click the START button and follow the on screen prompts.

Note: On screen prompts will include running the scripts – DO181C_23221_mode_s_top.scp while connecting multiple antenna ports to the power meter.

6. When the Measurement Status window indicates “Ready”, open windows explorer and navigate to C:\T3CAS_PPM\EXE\T3CAS_PPM\Results.
7. Open the following files and verify that no tests failed:

XPDR_MODE_S_0_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
XPDR_MODE_S_90_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
XPDR_MODE_S_180_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
XPDR_MODE_S_270_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt

8. Record the number of passing tests from each file into the Systems Test FTR (Appendix D).
9. Ensure that all data is stored in the necessary network folder.

Note: The power meter tool will prompt to change antenna port switch settings. When test is complete return all antenna switches to the down position.

Note: If a failure is present, select the “SCREEN CAPTURE” button and re-run the test. This will allow capture screen shots of the results for review.

C.4.8 RF Peak Output Power (DO-181C 2.3.2.2.2)

Note: This procedure includes the following DO-181C Tests:

2.3.2.2.3 Continuous Reply Rate Capability, Steps 1 and 2.

For Transmitter Power Measurements, the RF level is referenced to the unit’s antenna RF connector. The following tests are implemented by the VALFAC script file and the Power Meter program.

Test Procedure:

1. Set System Bench to Internal Xpdr and set Control Panel to XPNDR2 for all DO-181C scripts.
2. Open the T3CAS_PPM software program.
3. Enter test information.
 - a. Test Engineer
 - b. Test Environment (Room, Cold or Hot)
 - c. LRU Serial Number

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4. Under measurement type select “XPDR – Full Duty Power”
5. Ensure that the VISA Resource Name is set to GPIB0::13::INSTR for Power Meter GPIB address of 13 or GPIB0::14::INSTR for Power Meter GPIB address of 14.
6. Click the START button and follow the on screen prompts.

Note: On screen prompts will include running the script – DO181C_23222.scp.

7. When the Measurement Status window indicates “Ready”, open windows explorer and navigate to C:\T3CAS_PPMEXE\T3CAS_PPMResults.
8. Open the following files and verify that no tests failed:

XPDR_Channel_Power_0_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 XPDR_Channel_Power_90_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 XPDR_Channel_Power_180_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt
 XPDR_Channel_Power_270_TOP_RESULT_MM_DD_YYYY_HH_mm_ss_PASS/FAIL.txt

9. Record the number of passing tests from each file into the Systems Test FTR (Appendix D).
10. Ensure that all data is stored in the necessary network folder as result files that remain in the Results folder will be overwritten.

Note: The power meter tool will prompt to change antenna port switch settings. When test is complete return all antenna switches to the down position.

Note: If a failure is present, select the “SCREEN CAPTURE” button and re-run the test. This will allow capture screen shots of the results for review.

C.5 ADS-B Transmitter Performance Test Procedures (DO-260A)

No tests are required for ADS-B Transmitter Performance Test Procedures (DO-260A), because they are covered by DO-181C tests. Refer to Appendix C.4.

C.6 ADS-B Receiver Performance Test Procedures (DO-260A)

Table C-4: ADS-B Receiver Performance Test Summary

DO-260A Test	Test Description
2.3.2.3.1	TCAS Compatibility
2.3.2.4.1	In-Band Acceptance
2.3.2.4.2	Dynamic Range

C.6.1 Standard Test Setup

C.6.1.1 ValfacScript setup

Unless otherwise specified in a test, the following standard test conditions shall apply for the DO-260A tests:

- Open the ACSS RF ValfacScript tool and load the single aisle APM configuration.
- Set the number of Mode S intruders to = 150, the number of ATCRBS intruders to = 100, and the number of ground intruders to = 10.

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- Set the Valfac to a bottom directional antenna configuration.
- Set the control panel to “XPDR 1” and “TA/RA” mode.
- Switch the internal XPDR to “Standby” and the external XPDR to “On.”

C.6.2 TCAS Compatibility (DO-260A 2.3.2.3.1)

This test verifies that no more than 10% of ADS-B Messages received at a level of -78dBm or below are passed to TCAS surveillance function. The test transmits 4 Mode S DF-11 squitters into each of the 4 antenna ports (0, 90, 180, 270) for a period of 40 seconds, which provides a total of 160 squitters per antenna port. The squitters are injected at -78dBm. The T3CAS data recorder output is used to verify the replies were received and decoded correctly by counting the number of received intruders with the correct Mode S address. During the test, the unit is set to a test mode which inhibits TCAS transmissions and allows the unit to receive Mode S replies. The following Mode S intruders are used for each of the 4 antenna ports:

Each of the 4 antenna ports is tested independently to determine it has the required decoding probability. Each antenna port shall receive a maximum of 10% of the squitters (16 or less).

10 seconds of test squitters transmitted at a detectable power level are transmitted at the beginning of the scenario to ensure correct operation prior to the test.

The test procedure is equivalent to the MOPS test procedure. The MOPS test procedure uses a DF-17 ADS-B Squitter, however the T3CAS design does not forward DF-17 messages to the TCAS function. The test procedure is changed to use DF-11 squitter messages which are sent to the TCAS function.

Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario DO260A_2_3_2_3_1.scf.
2. Pass Criteria: When the test is finished, analyze the results file C:\VALFAC_03_Load_2 forQual\Script_batch\users\\ DO260A_2_3_2_3_1.scf.<date time>.rst. Examine the results file to verify the following pass criteria:

NUMBER OF TESTS PASSED = 4
NUMBER OF TESTS FAILED = 0

3. Verify the test result of the script and record the number of passing tests into the Systems Test FTR (Appendix D):

C.6.3 In-Band Acceptance (DO-260A 2.3.2.4.1)

This test verifies the UUT MTL is within required tolerances. The procedure is equivalent to the MOPS test procedure.

The ACSS RF Simulation System will transmit DF=17 messages to the UUT at each of the antenna ports (Top 0, Top 90, Top 180 and Top 270) and verify that $\geq 90\%$ of the messages are correctly received at the RF level and frequency specified in the following.

A total of 4 messages per second will be transmitted on each port for 50 seconds (200 total messages per port) for each of the RF power levels.

Table C-5: In Band Acceptance Test Criteria

Required Reception	RF Level (dBm)	Frequency (MHz)
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>90% (≥ 180 messages)	-84	1089.0
>90% (≥ 180 messages)	-84	1090.0
>90% (≥ 180 messages)	-84	1091.0

This test is run with the T³CAS Receiver Filter set to the narrow-band filter mode. (Test Mode #7 – Functional Test Facilities Mode), with the Internal Transponder in Standby and and External Transponder On.

Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario DO260A_2_3_2_4_1_Step1.scp.
2. Pass Criteria: When the test is finished, run the “inBandAnalysis” spreadsheet found in c:\VALFAC_03_Load_2 for Qual\macros to verify the correct number of transmissions are received.
3. Open the “Evaluate Test Data” tab.
4. Click the “Select Squitter CSV File” button and map to the .csv file in the directory C:\VALFAC_03_Load_2 for Qual\Script_batch\users\- 5. Click on the Evaluate Data button and wait for the analysis to finish. This process removes duplicate squitters.
- 6. Click on the “Results” tab and verify that cells B2, C2, D2 and E2 are greater than 180.
- 7. Record the lowest value of the cells B2, C2, D2, or E2 into the Systems Test FTR (Appendix D).
- 8. Reset the ACSS RF ValfacScript tool and repeat steps 1 through 7 for the following scenarios:

DO260A_2_3_2_4_1_Step2.scp
DO260A_2_3_2_4_1_Step3.scp

Note: Step 1 and Step 3 are not required over during hot and cold testing.

C.6.4 Dynamic Range (DO-260A 2.3.2.4.2)

This test verifies the UUT performance over the required dynamic range. The ACSS RF Simulation System will transmit DF=17 messages to the UUT at each of the antenna ports (Top 0, Top 90, Top 180 and Top 270) and verify that ≥ 99% of the messages are correctly received over the required dynamic range and that ≥ 15% of the messages are correctly received at -87dBm as indicated in the following table.

A total of 4 messages per second will be transmitted on each port for 50 seconds (200 total messages per port) for each of the RF power levels.

Table C-6: Dynamic Range

Required Reception	RF Level
>15% (≥ 30 messages)	-87 dBm
>99% (≥ 198 messages)	-81dBm (MTL+3dB)
>99% (≥ 198 messages)	-71dBm
>99% (≥ 198 messages)	-51dBm
>99% (≥ 198 messages)	-21dBm

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This test is run with the T³CAS Receiver Filter set to the narrow-band filter mode. (Test Mode #7 – Functional Test Facilities Mode), with the Internal and External Transponders in Standby.

Test Procedure:

1. In the ACSS RF ValfacScript tool, run the scenario DO260A_2_3_2_4_2_PART1.scp.
2. Pass Criteria: When the test is finished, run the “inBandAnalysis” spreadsheet found in c:\VALFAC_03_Load_2 for Qual\macros to verify the correct number of transmissions are received.
3. Open the “Evaluate Test Data” tab.
4. Click the “Select Squitter CSV File” button and map to the .csv file in the directory C:\VALFAC_03_Load_2 for Qual\Script_batch\users\- 5. Click on the Evaluate Data button and wait for the analysis to finish. This process removes duplicate squitters.
- 6. Click on the “Results” tab and verify that cells B2, C2, D2 and E2 are greater than 30 (15%).
- 7. Record the lowest value of into the Systems Test FTR (Appendix D).
- 8. Reset the ACSS RF ValfacScript tool and repeat steps 1 through 7 for the following scenarios, verifying the minimum number of replies:

- DO260A_2_3_2_4_2_PART2.scp, ≥ 198 replies (99%)
- DO260A_2_3_2_4_2_PART3.scp, ≥ 198 replies (99%)
- DO260A_2_3_2_4_2_PART5.scp, ≥ 198 replies (99%)
- DO260A_2_3_2_4_2_PART8.scp, ≥ 198 replies (99%)

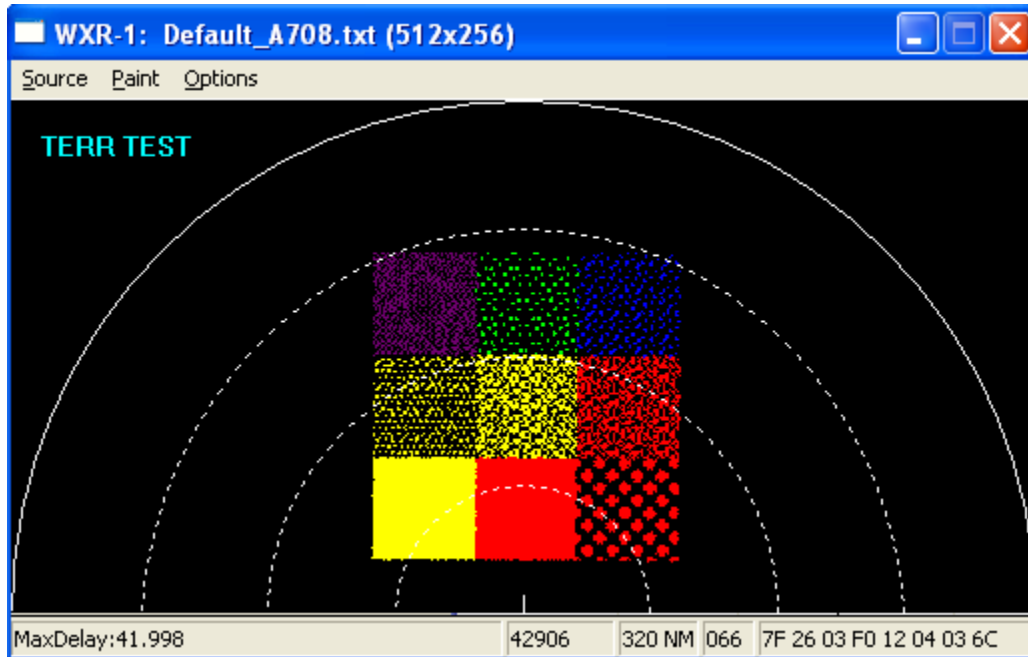
Note: B2, C2, D2, and E2 are a representation of how results will be presented. It is permissible for them to be in different rows as long as the columns are the same.

C.7 TAWS CRC Verification

1. Open the ACSS RF ValfacGUI tool.
2. Load the single aisle APM configuration. This should be the default (T3CAS_V3_Airbus_SA_CFG1.txt).
3. Click Start.
4. Load the T3CAS_Test.mon. This is done by restoring the “Selected I/O Monitor” tab at the bottom of the screen and then clicking on the “Load” button. When the pop up appears select the T3CAS_Test.mon file. It is then encouraged to minimize all windows other than the “Operations”.
5. Set the front panel to one of the following configurations:
 - a. Configuration 1:
 - i. Internal XPDR to “On”
 - ii. External XPDR to “Standby”
 - iii. Air/Ground discrete to “ground”

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- iv. Control Panel to “XPDR 2” and “TA/RA”.
 - b. Configuration 2:
 - i. Internal XPDR to “Standby”
 - ii. External XPDR to “On”
 - iii. Air/Ground discrete to “ground”
 - iv. Control Panel to “XPDR 2” and “TA/RA”.
6. Power the UUT.
 - a. Steps for configuration 1 from step 6:
 - i. Turn power on to the UUT.
 - b. Steps for configuration 2 from step 6:
 - i. Turn power on to the UUT.
 - ii. After power on is complete set Internal XPDR to “On” and then External XPDR to “Standby”
7. Verify on the VSI/TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages).
8. Place Aircraft on Ground by toggling Air/GND switch to GND and Landing Gear switch to DOWN. Ensure that the Terrain Fail and Terrain NA lamps are not illuminated.
9. Open the WXR window on the Valfac GUI. A black screen should appear. Wait 90 seconds for unit to complete internal CRC checks.
10. Open the GCAM window on the Valfac GUI.
11. Click on the discrete tab in this window.
12. Scroll down the discrete tab to DI_GLIDESLOPE_CANCEL, RTP-10A. Click on Value to change from “Open” to “Ground”.
13. Click “apply” at the lower right of this window.
14. On DI_GLIDESLOPE_CANCEL, RTP-10A, now press again on Value to change from “Ground” to “Open”. These steps simulate the action of a momentary switch being pressed.
15. Click “apply” at the lower right of this window.
16. Monitor that this self test image appears:



17. Listen for aural of “Terrain Awareness System Pass”.

C.8 Event Log Test

Test Procedure:

1. Open the ACSS RF ValfacGUI tool.
2. Load the single aisle APM configuration. This should be the default (T3CAS_V3_Airbus_SA_CFG1.txt).
3. Click Start.
4. Load the T3CAS_Test.mon. This is done by restoring the “Selected I/O Monitor” tab at the bottom of the screen and then clicking on the “Load” button. When the pop up appears select the T3CAS_Test.mon file. It is then encouraged to minimize all windows other than the “Operations”.
5. Set the front panel to the following:
 - Internal XPDR to “On”
 - External XPDR to “Standby”
 - Set the control panel to “XPDR 1” and “TA/RA” mode.

Note: The Flight Data Recorder discrete input is already “active” in the current test set-up configuration. Therefore, the parity pin does not need to be modified.

6. Power the UUT.
7. Verify on the VSI/TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages).
8. On the VALFAC PC’s desktop, double click on the WebEddit tool.

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9. After WebEddit connects, select “CCP Maintenance Interface” from the “Target” drop down menu on the main (top) toolbar.
10. Click on “Clear Event Log.”

Note: Clearing the Event Log before proceeding ensures the correct Event is logged during this test.

11. Adjust the following settings on the ACSS RF ValfacGUI tool:
 - Air/Ground discrete to air
12. Run the Event.mdl file in the SimGUI until the Event (a Resolution Advisory has been visually seen and aurally heard) has occurred (approximately 90 seconds).
13. Adjust the following settings on the ACSS RF ValfacGUI tool:
 - Air/Ground discrete to ground
14. On the VALFAC PC’s desktop, double click on the WebEddit tool.
15. After WebEddit connects, select “CCP Maintenance Interface” from the “Target” drop down menu on the main (top) toolbar.
16. In WebEddit, click on “Dump Event Log”. Once done decoding, save the “ccp_mifa_dump_event_log_...._decoder_001.htm” and “EVENT_CAS_DATA.csv” files to the results directory.
17. Verify the Event has been recorded in the Event Log. See EVENT_CAS_DATA.csv file generated by WebEddit. In the “P” column labeled “intruderThreatCategory” ensure that 3’s (TA’s) and 4’s (RA’s) are listed.
18. Record “Yes” or “Y” if the Event has been recorded into the Systems Test FTR (Appendix D). Otherwise, record “No” or “N” if the Event has not been recorded into the Systems Test FTR.
19. Click on “Clear Event Log.”

C.9 BITE Fault Log Test

When all of the testing is completed, dump and clear the BITE Fault Log. Confirm there are no self-test failures in the log.

Test Procedure:

1. Open the ACSS RF ValfacGUI tool.
2. Load the single aisle APM configuration. This should be the default (T3CAS_V3_Airbus_SA_CFG1.txt).
3. Click Start.
4. Load the T3CAS_Test.mon. This is done by restoring the “Selected I/O Monitor” tab at the bottom of the screen and then clicking on the “Load” button. When the pop up appears select the T3CAS_Test.mon file. It is then encouraged to minimize all windows other than the “Operations”.
5. Set the front panel to one of the following configurations:
 - a. Configuration 1:
 - i. Internal XPDR to “On”

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- ii. External XPDR to “Standby”
 - iii. Air/Ground discrete to “ground”
 - iv. Control Panel to “XPDR 2” and “TA/RA”.
 - b. Configuration 2:
 - i. Internal XPDR to “Standby”
 - ii. External XPDR to “On”
 - iii. Air/Ground discrete to “ground”
 - iv. Control Panel to “XPDR 2” and “TA/RA”.
- 6. Power the UUT.
 - a. Steps for configuration 1 from step 6:
 - iii. Turn power on to the UUT.
 - b. Steps for configuration 2 from step 6:
 - iv. Turn power on to the UUT.
 - v. After power on is complete set Internal XPDR to “On” and then External XPDR to “Standby”
- 7. Verify on the VSI/TRA that TCAS is operational (no TCAS FAIL or TCAS OFF messages).
- 8. On the VALFAC PC’s desktop, double click on the WebEddit tool.
- 9. After WebEddit connects, select “CCP Maintenance Interface” from the “Target” drop down menu on the main (top) toolbar.
- 10. Click on "Fault Logs" and then on "Dump Fault Log".
- 11. Save the ccp_mifa_dump_fault_log...bin file to the results directory by making a single left click on the hyperlink, click save, and navigating to the appropriate folder. Also upload the .bin file to the “T3CAS Fault Logs” workspace. When saving this file to the workspace please name the file accordingly: TQEXXXXX_C.8_ENV_dump_fault_log_YYYY_MM_DD_HHmms Where TQEXXXXX is the serial number of the unit under test, ENV is either Hot, Cold or ROOM. *Note: This file will need to be renamed to reflect this format.*
- 12. Click on “Clear BITE Fault Log”.

Note: Box will reset upon clearing of the fault log.

C.10 Backup

Backup all files and folders to network drive.

C.11 Regression

See Appendix D for regression testing requirements.

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D SYSTEMS TEST FTR

UUT Test Report
Station 9001041-001 rev -

Serial Number:	Part Number:
Mod:	Date / Time:
Operator:	Environment:
Notes:	

Script Name	ATP Section	Pass/Fail		Meas	Pass	Room	Hot / Cold
		Min	Max				
Part Number Dump	C.1					X	X
Flight Operations Test (Ground/AIR)	C.2	NO FAULTS					X
TCAS Transmitter Frequency (Top 0)	C.3.2	1029.990	1030.010			X	X
Mode_S_0_TOP_RESULT.txt	C.3.3	23	23				X
Mode_S_90_TOP_RESULT.txt	C.3.3	23	23				X
Mode_S_180_TOP_RESULT.txt	C.3.3	23	23				X
Mode_S_270_TOP_RESULT.txt	C.3.3	23	23				X
Mode_S_0_BOT_RESULT.txt	C.3.3	23	23				X
Mode_S_90_BOT_RESULT.txt	C.3.3	23	23				X
Mode_S_180_BOT_RESULT.txt	C.3.3	23	23				X
Mode_S_270_BOT_RESULT.txt	C.3.3	23	23				X
Whisper Shout Tests (Subset)	C.3.4	41	41				X
DO-185B_2.4.2.1.2.1_ATCRBS_freq.scp	C.3.6.1	6	6			X	X
DO-185B_2.4.2.1.2.1_ATCRBS_Factory.scp	C.3.6.1	15	15			X	X
DO-185B_2.4.2.1.2.1_NB_Factory.scp	C.3.6.2	20	20			X	X
DO-185B_2.4.2.1.2.2_ATCRBS_Factory.scp	C.3.7.1	6	6			X	X
DO-185B_2.4.2.1.9.1_1090_Macro.xls	C.3.8	0	8			X	X
DO181C_2321_step1_updt.scp (1029.8)	C.4.2	0	1			X	
DO181C_2321_step1_updt.scp (1030)	C.4.2	0	1			X	
DO181C_2321_step1_updt.scp (1030.2)	C.4.2	0	1			X	
DO181C_2321_step2_updt.scp	C.4.2	16	16			X	X
DO181C_2321_step3_updt.scp	C.4.2	30	30			X	X
DO181C_2321_step4_updt.scp	C.4.2	2	2			X	X
DO181C_2321_step5_updt.scp	C.4.2	16	16			X	X

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Script Name	ATP Section	Pass/Fail		Meas	Pass	Room	Hot / Cold
		Min	Max				
DO181C_2321_step6_updt.scp	C.4.2	30	30			X	X
DO181C_2321_step7_updt.scp	C.4.2	1	1			X	X
DO181C_2324_step1_2_3_updt.scp	C.4.3	8	8			X	X
DO181C_2325_step1_updt.scp	C.4.4	2	2			X	X
DO181C_2325_step2_updt.scp	C.4.4	2	2			X	X
DO181C_2325_step6_updt.scp	C.4.4	12	12			X	X
DO181C_2327_updt_Factory.scp	C.4.5	4	4			X	X
DO181C_23210_updt_Factory.scp	C.4.6	12	12			X	X
XPDR_MODE_S_0_TOP_RESULT.txt	C.4.7	6	6				X
XPDR_MODE_S_90_TOP_RESULT.txt	C.4.7	6	6				X
XPDR_MODE_S_180_TOP_RESULT.txt	C.4.7	6	6				X
XPDR_MODE_S_270_TOP_RESULT.txt	C.4.7	6	6				X
XPDR_Channel_Power_0_TOP_RESULT.txt	C.4.8	1	1				X
XPDR_Channel_Power_90_TOP_RESULT.txt	C.4.8	1	1				X
XPDR_Channel_Power_180_TOP_RESULT.txt	C.4.8	1	1				X
XPDR_Channel_Power_270_TOP_RESULT.txt	C.4.8	1	1				X
DO260A_2_3_2_3_1.scp	C.6.2	4	4			X	X
DO260A_2_3_2_4_1_Step1.scp	C.6.3	180				X	
DO260A_2_3_2_4_1_Step2.scp	C.6.3	180				X	X
DO260A_2_3_2_4_1_Step3.scp	C.6.3	180				X	
DO260A_2_3_2_4_2_PART1.scp	C.6.4	30				X	
DO260A_2_3_2_4_2_PART2.scp	C.6.4	198				X	X
DO260A_2_3_2_4_2_PART3.scp	C.6.4	198				X	X
DO260A_2_3_2_4_2_PART5.scp	C.6.4	198				X	X
DO260A_2_3_2_4_2_PART8.scp	C.6.4	198				X	X
Database CRC	C.7	Test Pass					X
Event Log Test	C.8	Event Recorded				X	X
Fault Log Cleared	C.9	Cleared				X	X

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E TEMPERATURE REGRESSION TESTING

There are five different levels to regression testing. Each of these should be performed in both the hot and cold test environment to ensure all tests are passing.

Regression tests have been grouped into three categories:

1. Transmitter Tests
2. TCAS Receiver/ADSB Tests
3. Transponder Receiver

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UUT Regression Test Report – Transmitter Tests

Station 9001041-001 rev -

Serial Number:	Part Number:
Mod:	Date/Time:
Operator:	Environment:
Notes:	

Script Name	ATP Section	Pass/Fail		Meas	Pass
		Min	Max		
Part Number Dump	C.1				
TCAS Transmitter Frequency (Top 0)	C.3.2	1029.990	1030.010		
Mode_S_0_TOP_RESULT.txt	C.3.3	23	23		
Mode_S_90_TOP_RESULT.txt	C.3.3	23	23		
Mode_S_180_TOP_RESULT.txt	C.3.3	23	23		
Mode_S_270_TOP_RESULT.txt	C.3.3	23	23		
Mode_S_0_BOT_RESULT.txt	C.3.3	23	23		
Mode_S_90_BOT_RESULT.txt	C.3.3	23	23		
Mode_S_180_BOT_RESULT.txt	C.3.3	23	23		
Mode_S_270_BOT_RESULT.txt	C.3.3	23	23		
Whisper Shout Tests (Subset)	C.3.4	41	41		
XPDR_MODE_S_0_TOP_RESULT.txt	C.4.7	6	6		
XPDR_MODE_S_90_TOP_RESULT.txt	C.4.7	6	6		
XPDR_MODE_S_180_TOP_RESULT.txt	C.4.7	6	6		
XPDR_MODE_S_270_TOP_RESULT.txt	C.4.7	6	6		
XPDR_Channel_Power_0_TOP_RESULT.txt	C.4.8	1	1		
XPDR_Channel_Power_90_TOP_RESULT.txt	C.4.8	1	1		
XPDR_Channel_Power_180_TOP_RESULT.txt	C.4.8	1	1		
XPDR_Channel_Power_270_TOP_RESULT.txt	C.4.8	1	1		
Event Log Test	C.8	Event Recorded			
Fault Log Cleared	C.9	Cleared			

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UUT Regression Test Report – TCAS Receiver/ADSB Tests

Station 9001041-001 rev -

Serial Number:	Part Number:
Mod:	Date/Time:
Operator:	Environment
Notes:	

Script Name	ATP Section	Pass/Fail		Meas	Pass
		Min	Max		
Part Number Dump	C.1				
DO-185B_2.4.2.1.2.1_ATCRBS_Factory.scp	C.3.6.1	15	15		
DO-185B_2.4.2.1.2.1_ATCRBS_freq.scp	C.3.6.2	6	6		
DO-185B_2.4.2.1.2.1_NB_Factory.scp	C.3.6.2	20	20		
DO-185B_2.4.2.1.2.2_ATCRBS_Factory.scp	C.3.7.1	6	6		
DO-185B_2.4.2.1.9.1_1090_Macro.xls	C.3.8	0	8		
DO260A_2_3_2_3_1.scp	C.6.2	4	4		
DO260A_2_3_2_4_1_Step1.scp	C.6.3	180			
DO260A_2_3_2_4_1_Step2.scp	C.6.3	180			
DO260A_2_3_2_4_1_Step3.scp	C.6.3	180			
DO260A_2_3_2_4_2_PART2.scp	C.6.4	198			
DO260A_2_3_2_4_2_PART3.scp	C.6.4	198			
DO260A_2_3_2_4_2_PART5.scp	C.6.4	198			
DO260A_2_3_2_4_2_PART8.scp	C.6.4	198			
Event Log Test	C.8	Event Recorded			
Fault Log Cleared	C.9	Cleared			

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UUT Regression Test Report – Transponder Receiver

Station 9001041-001 rev -

Part Number:	Serial Number:
Mod:	Date/Time:
Operator:	Environment:
Notes:	

Script Name	ATP Section	Pass/Fail		Meas	Pass
		Min	Max		
Part Number Dump	C.1				
DO181C_2321_step2_updt.scf	C.4.2	16	16		
DO181C_2321_step3_updt.scf	C.4.2	30	30		
DO181C_2321_step4_updt.scf	C.4.2	2	2		
DO181C_2321_step5_updt.scf	C.4.2	16	16		
DO181C_2321_step6_updt.scf	C.4.2	30	30		
DO181C_2321_step7_updt.scf	C.4.2	1	1		
DO181C_2324_step1_2_3_updt.scf	C.4.3	8	8		
DO181C_2325_step1_updt.scf	C.4.4	2	2		
DO181C_2325_step2_updt.scf	C.4.4	2	2		
DO181C_2325_step6_updt.scf	C.4.4	12	12		
DO181C_2327_updt_Factory.scf	C.4.5	4	4		
DO181C_23210_updt_Factory.scf	C.4.6	12	12		
Event Log Test	C.8	Event Recorded			
Fault Log Cleared	C.9	Cleared			

Note: Deviation from this testing requires engineering approval.

E.1 Full Retest

A full retest is required whenever there are failures across all categories (Transmitter Tests, TCAS Receiver/ADSB Tests, and Transponder Receiver), as well as any time that a board or component are replaced.

If failing all three categories, perform necessary updates and rework and then perform both hot and cold testing again.

E.2 TCAS Receiver/ADSB Receiver Retest

A TCAS receiver and ADSB receiver retest is allowed if all of the transmitter and transponder receiver have passed but there are failures within the TCAS or ADSB sections.

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Prior to making any calibration changes to the LRU ensure that a “prncal” is performed and captured using HTS.

Once the calibration adjustments have been made ensure a “prncal” is performed and captured using HTS. The before and after calibration files must be compared to ensure that only the desired fields have been affected. The acceptable calibration changes to correct the TCAS receiver and ADSB receiver calibration are labeled as “TCAS MTL data”. Any changes outside these values require engineering acceptance.

One example of this data is:

TCAS MTL data	0	90	180	270
MTL Top without 10 dB attenuator	0000	0081	0000	0004
Bottom without 10 dB attenuator	0081	0081	0081	0004
MTL Top with 10 dB attenuator	0002	0004	0006	0008
Bottom with 10 dB attenuator	0001	0004	0004	0008

If performing the first environment, either hot or cold and a failure is present, perform the necessary calibration changes to the unit and then repeat the TCAS receiver and ADSB receiver retest subset for that environment. Once the first environment is passed proceed to the second environment and perform full run of systems test in that environment.

If performing the second environment, either hot or cold and a failure is present, perform the necessary calibration changes to the unit and then repeat the TCAS receiver and ADSB receiver retest subset for that environment. Once the second environment is passed proceed to the first environment and perform the same TCAS receiver and ADSB receiver retest subset of tests.

E.3 Transponder Receiver Retest

A transponder receiver retest is allowed if all of the Transmitter, TCAS receiver and ADSB receiver tests have passed but there are failures within the Transponder receiver section.

Prior to making any calibration changes to the LRU ensure that a “prncal” is performed and captured using HTS.

Once the calibration adjustments have been made ensure a “prncal” is performed and captured using HTS. The before and after calibration files must be compared to ensure that only the desired fields have been affected. The acceptable calibration changes to correct the Transponder receiver calibration are labeled as “XPDR MTL Top” and “XPDR MTL Bottom”. Any changes outside these values require engineering acceptance.

One example of this data is:

XPDR MTL Top:	0=0003	90=0082	180=0081	270=0002
XPDR MTL Bottom:	0=0088	90=0084	180=0087	270=0002

If performing the first environment, either hot or cold and a failure is present, perform the necessary calibration changes to the unit and then repeat the Transponder receiver retest subset listed for that environment. Once the first environment is passed proceed to the second environment and perform full run of systems test in that environment.

If performing the second environment, either hot or cold and a failure is present, perform the necessary calibration changes to the unit and then repeat the Transponder receiver retest subset listed for that environment. Once the second environment is passed proceed to the first environment and perform the same Transponder receiver retest subset of tests.

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E.4 Transmitter Retest

A transmitter retest is allowed if all of the transponder receiver, TCAS receiver and ADSB receiver tests have passed but there are failures within the transmitter section.

Prior to making any calibration changes to the LRU ensure that a "prncal" is performed and captured using HTS.

Once the calibration adjustments have been made ensure a "prncal" is performed and captured using HTS. The before and after calibration files must be compared to ensure that only the desired fields have been affected. The acceptable calibration changes to correct the Transponder receiver calibration are labeled as "DAC Settings", "Transponder Calibration Data" and "Transponder Forward Pwr Temp". Any changes outside these values require engineering acceptance.

One example of each of these is:

DAC Settings 0 degree port:

Index	Pwr	C1a	C1m	C2a	C2m	FP		DPSK
						Top	Bot	
0	56	400	300	296	335	3412	3492	0
1	55	400	734	216	335	3372	3466	0
2	54	400	938	200	627	3312	3368	0
3	53	400	827	158	751	3291	3353	2
4	52	400	767	177	872	3250	3301	3
5	51	400	734	173	985	3210	3252	3
6	50	400	781	119	966	3170	3204	3
7	49	0	2047	0	804	3132	3162	3
8	48	0	2047	0	838	3092	3118	3
9	47	0	2047	0	869	3051	3075	3
10	46	0	2047	0	899	3011	3031	3

Note: This section goes to index of 31 and is repeated for 0, 90, 180 and 270 ports.

Transponder Calibration Data:

Directional Antenna

	Port 0		Port 90		Port 180		Port 270	
	DAC	FP	DAC	FP	DAC	FP	DAC	FP
Top	901	3242	993	3270	889	3191	776	3226
Bot	900	3276	1005	3304	880	3311	797	3286

Transponder Forward Pwr Temp	0	90	180	270
Hot	-20.	-20.	-20.	-20.
Cold	40.	40.	40.	40.

If performing the first environment, either hot or cold and a failure is present, perform the necessary calibration changes to the unit and then repeat the transmitter retest subset listed for that environment. Once the first environment is passed proceed to the second environment and perform full run of systems test in that environment.

If performing the second environment, either hot or cold and a failure is present, perform the necessary calibration changes to the unit and then repeat the transmitter retest subset listed for that environment. Once the second environment is passed proceed to the first environment and perform the same transmitter retest subset of tests.

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E.5 Multiple Category Retest

A multiple category retest is allowed if one of the categories has passed and the other two have failed. One example of this would be if the transmitter and transponder receiver tests failed and the TCAS receiver and ADSB receiver tests all passed.

If this situation occurs the passing category does not need to be re-run and the failing categories would need to be adjusted and then retested per the retest requirements listed above.

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F SYSTEM SUBSET TESTS

The following subset of system tests should be completed per the instructions in Appendix C after the 100 hour burn-in as listed in Section 5. These tests are selected to verify continued operation of the UUT after the burn-in process and should be performed at room temperature. Ensure all tests are passing.

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UUT Test Report – Subset
Station 9001041-001 rev -

Serial Number:	Part Number:
Mod:	Date / Time:
Operator:	Environment:
Notes:	

Script Name	ATP Section	Pass/Fail		Meas	Pass
		Min	Max		
Part Number Dump	C.1				
Mode_S_0_TOP_RESULT.txt	C.3.3	23	23		
Mode_S_90_TOP_RESULT.txt	C.3.3	23	23		
Mode_S_180_TOP_RESULT.txt	C.3.3	23	23		
Mode_S_270_TOP_RESULT.txt	C.3.3	23	23		
Mode_S_0_BOT_RESULT.txt	C.3.3	23	23		
Mode_S_90_BOT_RESULT.txt	C.3.3	23	23		
Mode_S_180_BOT_RESULT.txt	C.3.3	23	23		
Mode_S_270_BOT_RESULT.txt	C.3.3	23	23		
Whisper Shout Tests (Subset)	C.3.4	41	41		
XPDR_MODE_S_0_TOP_RESULT.txt	C.4.7	6	6		
XPDR_MODE_S_90_TOP_RESULT.txt	C.4.7	6	6		
XPDR_MODE_S_180_TOP_RESULT.txt	C.4.7	6	6		
XPDR_MODE_S_270_TOP_RESULT.txt	C.4.7	6	6		
XPDR_Channel_Power_0_TOP_RESULT.txt	C.4.8	1	1		
XPDR_Channel_Power_90_TOP_RESULT.txt	C.4.8	1	1		
XPDR_Channel_Power_180_TOP_RESULT.txt	C.4.8	1	1		
XPDR_Channel_Power_270_TOP_RESULT.txt	C.4.8	1	1		
DO260A_2_3_2_4_2_PART2.scp	C.6.4	198			
Database CRC	C.7	Test Pass			
Event Log Test	C.8	Event Log Rec			
Fault Log Test	C.9	Test Pass			

END OF DOCUMENT